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A PORTFOLIO OF STABILITY CHARACTERISTICS OF INCOMPRESSIBLE BOUNDARY LAYERS

by

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with contributions from

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SUMMARY

A collection of linear amplification and propagation rates (temporal and spatial) for two similar and non-similar families of boundary layers is presented in graphical and tabular form. Their usage is illustrated for tracing the growth of disturbances in a flat-plate boundary layer which develops in x and varies periodically with t. If a user of the Portfolio can match the $U''(y)$ distribution of his profile with that of a Portfolio profile over the central 80% of the boundary layer, the stability characteristics of the matched profile seem to provide him with satisfactory approximations for those of his own profile.

The utilization of the Portfolio information for estimating transition Reynolds numbers is discussed. Much improvement of the theoretical and experimental knowledge concerning free-stream disturbances and the specific manner in which they bring about the growth of Tollmien-Schlichting waves will be needed before further progress can be made. Analysis of the numerical variations of stability characteristics with various features of the related profiles clarifies the role of $U''(y)$ and of the location of the inflection point. The usual shape factor H emerges as the only simple parameter capable of correlating satisfactorily the minimum critical Reynolds number for non-similar profiles.

Throughout, emphasis is placed on relating the idealizations of the stability theory to physical processes in the boundary layer.

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SOMMAIRE

Un recueil de vitesses linéaires d'amplification et de propagation (temporelles et spatiales) pour deux familles de couches limites similaire et non similaire est présenté sous forme de graphiques et de tableaux. Leur application est montrée à titre d'exemple pour suivre la croissance de perturbations de la couche limite sur une plaque plane, qui évolue en x et varie périodiquement avec t. Si l'utilisateur du présent "Portfolio" peut adapter la répartition $U''(y)$ de son profil à celle d'un profil figurant dans le "Portfolio" sur les 80% centraux de la couche limite, les caractéristiques de stabilité du profil ainsi adapté semblent lui fournir des approximations satisfaisantes pour les caractéristiques de son propre profil.

L'utilisation des données du "Portfolio" en vue de l'estimation des nombres de Reynolds de transition est examinée. Il faudra une augmentation importante des connaissances théoriques et experimentales concernant les perturbations du courant libre et la façon particulière dont elles font naître des ondes Tollmien-Schlichting avant de pouvoir réaliser de nouveaux progrès. L'analyse des variations numériques des caractéristiques de stabilité avec différents aspects des profils correspondants permet d'éclaircir le rôle joué par $U''(y)$ et la position du point d'inflection. Le facteur habituel de forme H se dégage comme étant le seul paramètre simple qui soit capable d'assurer la corrélation, de manière satisfaisante, des nombres de Reynolds critiques minima pour les profils non similaires.

Dans tous les exposés on souligne l'importance de relier l'idealisation de la théorie de la stabilité aux processus physiques de la couche limite.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

NOTATION

A_n	velocity profile coefficients, see Equation (A3) and Appendix B
A_2/A_1	amplification ratio of a disturbance between two points of its trajectory
c	complex wave velocity, see Table I
c_g	group velocity, see Table II
F	dimensionless stream function of the mean flow, FS family
H	shape factor, δ/θ
N_A	amplitude parameter of free-stream unsteadiness, $\Delta U_0/U_0$
(N_A, X_ω, Ω)	triplet used to specify profiles of O family
$R, R_\delta, R_{\delta\star}, R_x$	Reynolds number, based on boundary-layer thickness, displacement thickness, streamwise coordinate
R_t	transition Reynolds number, i.e. appearance of a turbulent spot
R_L	Reynolds number per unit length, $U_{e\star}/\nu_\star$
R_{ns}	non-steady Reynolds number, see Equation (13) and sequel
R_c	critical Reynolds number, see Figure 4
$S(\omega_p)$	wave packet spectral distribution
(U, y)	pair of numbers used to specify velocity at and location of inflection point, see Figures 3
u'	rms value of longitudinal component of disturbance velocity
U	longitudinal velocity component of mean flow
U_e	longitudinal velocity component at edge of boundary layer
U_0	mean longitudinal velocity component in free stream
$U'(y)$	vorticity distribution of mean flow
$U''(y)$	although the usage is not exact, the dimensionless second derivative of U with respect to y is often referred to as the "curvature" of the velocity profile
v	normal component of the disturbance velocity
x	coordinate along surface
X_ω	$= x_\star \omega_\star / U_{0\star} = x\omega/U_0$
y	coordinate normal to surface
α	disturbance wave number, $\alpha_r + i\alpha_i$

β	(a) Hartree β, dimensionless velocity gradient (b) disturbance frequency $\beta_r + i\beta_i$
δ	boundary-layer thickness
δ^*	displacement thickness
ν	kinematic viscosity
η	dimensionless coordinate normal to surface
$\eta\delta$	η value at edge of boundary layer, see Table III
ω	(a) oscillation frequency (b) disturbance frequency $\omega_r + i\omega_i$
ω_r	dimensionless form of disturbance frequency, $\omega_{r*}\nu_*/U_{0*}^2$ (Wazzan-Okamura-Smith technique)
θ	momentum thickness
ϕ	velocity phase shift
ΔU_0	amplitude of oscillation in free stream
Λ	amplitude parameter $\Delta U/\Delta U_{max}$ in Reference 27
Ω	phase of free-stream oscillations, $\Omega = \omega_* t_*$

Subscripts

c	critical
i	imaginary part of a complex quantity
r	real part of a complex quantity
n	the n^{th} mode
*	where there may be doubt, dimensional quantities are indicated by $(\ )_*$

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1. INTRODUCTION

1.1 Comments on the Role and Validity of Linear Stability Theory

Ever since the classical experiments of Schubauer and Skramstad[1] and Liepmann[2] it was clear that the Prandtl-Tollmien-Schlichting linear mechanism can play a dominant role in the change of a flat-plate laminar boundary layer into a turbulent layer when free-stream disturbances are low. Recent experiments in the Blasius layer, e.g. Wells[3] and Spangler and Wells[4], demonstrate that fluctuations occurring at the critical Reynolds number, R_c, may amplify over 10,000 times before transition sets in and that much experimental research will be required to clarify how various free-stream disturbances get "internalized" in the boundary layer as amplifying Tollmien-Schlichting waves (henceforth called TS waves). To cope with the problem of the difference between R_c and R_t (the Reynolds number of the transition zone) the predictor of transition needs information on the amplification characteristics of his particular boundary layer rather than on R_c alone. The present report provides him with a wealth of such characteristics for several families of boundary layers which should help to bracket those of his layer of interest. As to the problem of the feeding of TS waves by free-stream disturbances, the discussion (Sections 2.1 to 2.3) of the relationship between stability theory and experiment should clarify some of the issues.

A comprehensive review of transition of attached boundary layers and its intricate relations to stability theory, including effects of compressibility, cooling, mass transfer, three-dimensionality, etc., was recently completed by Morkovin[5]. Here we focus on two-dimensional incompressible boundary layers.

Anyone who has tried to compute the development of velocity profiles $U(x,y)$ of a steady two-dimensional boundary layer over a prescribed wall shape appreciates how varied these profiles can be. In fact, since the stability characteristics depend very sensitively on $U''(y)$, ideally the predictor should have at his disposal a computer program, such as described by Smith and Clutter[6], for generating his non-similar boundary-layer profiles step by step. However, even approximate techniques such as that employed by Quick and Schröder[7] for boundary-layer development over a wavy wall, illustrate the variety of practically important profiles and, in particular, the frequent occurrence of non-similar inflected profiles for which U'' vanishes at some distance from the wall.

Inflected profiles are most often, but not always, more unstable than profiles with purely negative U''. Already Betchov and Criminale noted the strongly stabilizing effect of the proximity of the inflection point to the wall (see pp. 36 and 82 of Reference 8). However, even locally occurring adverse pressure gradients, causing inflected profiles, are known to promote transition, by acting as powerful local amplifiers. They may be aptly described as preamplifiers for downstream uninflected profiles (see Chapter V of Reference 5). The inflected profiles form, so to speak, the weakest link in the chain of profiles which

"receive the traveling disturbances from their antecedents, amplify or damp them locally, and then pass them onto their downstream neighbors" (see fluctuation traces of Figure 17.1 and related discussion in Schlichting[9a]).

As will be seen, stability theory neglects the x-variation of mean profiles as being of secondary importance and treats x as a dormant parameter. This "local-constant-base" or "quasi-parallel flow" approximation can be generalized to time-dependent boundary layers, where both x and t are treated as dormant parameters, e.g. Obremski and Morkovin[10], Kármán and Lin[30]. It is believed that for many practical unsteady flows the characteristic times of the TS waves are sufficiently short in comparison with those of the base flow for the approximation to be valid. The assumption of "local constant base" thus provides a useful extension for the existing stability theory and, in particular, for the results in this Portfolio. In view of the mathematical difficulties of stability theory of the x- and t-dependent flows[27,34,59], the limitations on the applicability of the assumption of local constant base may well be gleaned first from comparison with suitably designed experiments.

An unexpected application of linear stability theory arose in the case of the last stages of development of non-linear, overgrown TS waves which lead to instantaneous, highly inflected velocity profiles, e.g. Klebanoff and Tidstrom[11], Kovasznay et al.[12], Klebanoff et al.[13], and Hama and Nutant[14]. Greenspan and Benney[15] showed that unsteady linear stability theory applied to a strongly idealized family of changing profiles yielded secondary instability characteristics consistent with the experimental observations in References 11-14. However, Klebanoff (see p.29 of Reference 13) demonstrated that a *quasi-steady* model of an inflected profile due to a three-dimensional single-roughness element matches the characteristics of the observed secondary instability at least as well as the Greenspan-Benney truly unsteady mode. The tentative lessons we can draw from this research support the probability of usefulness of quasi-steady modeling and suggest that linear theory of highly unstable profiles can perhaps be usefully grafted onto non-linear phenomena. Such an extended role of the powerful linear amplifying mechanism vis-a-vis non-linear processes (including possibly contributions to the self-regeneration of turbulent boundary layers themselves) was considered recently by Morkovin[16].

Another application of linear stability techniques, in fact to turbulent flow itself, has been demonstrated by Landahl[60]. In his waveguide model for turbulent shear flow he treats the fluctuations as linear Orr-Sommerfeld modes which are being driven by the non-linear fluctuating turbulent stress terms. The model requires all linear terms to be damped and shows that the most lightly damped ones dominate the statistical averages. (See also Section 2.3.)

For more complete mathematical background and existing correlations between stability theory and experiment the reader is referred to Lin[17], Schlichting[9], Stuart[18], and Shen[19]. Lighthill[20] and Tani[21] supply additional physical insights into the instability mechanisms. The existing theoretical correlations for even the simplest parameter, R_c, of inflected decelerating profiles exhibit a great deal of scatter, e.g. Figure IX.14 of Reference 18. The experience leading to the present report indicates that most of this scatter is probably due to inaccuracies in the representations of the profiles and in the approximations of the asymptotic theory*. In other words, while Pretsch[22] valiantly carried out computations of detailed stability characteristics for approximations to the Falkner-Skan family of similarity profiles in 1941-42, it is only the recent application of sophisticated computer techniques, e.g. Kaplan[23], Landahl[24], Wazzan, Okamura and Smith (WOS)[25], Radbill et al.[26], Grosch and Salwen[27], etc., that guarantees adequate computational accuracy. Indeed the cross-checks between these substantially different computer techniques is most gratifying. With the recognition of wider applicability of linear stability theory and the emergence of reliable computer techniques for both low and high Reynolds numbers, the present effort of compilation of stability characteristics for a large number of velocity profiles thus appears warranted. For industrial groups faced with repeated design problems involving

* See, for example, WOS[70] for a discussion of these effects in the case of separated laminar boundary layers.

stability and transition at low speeds, it would seem logical to couple the step-by-step computer programs for the local velocity profiles, e.g. Reference 6, with elements of stability programs, such as given in References 23-27, on a routine basis. Such a program is currently under development at the McDonnell-Douglas Aircraft Company[28].

1.2 Guide to the Portfolio

Selected members of a three-parameter non-similar family of profiles*, dubbed the O family, plus a number of profiles designed to bring out special effects of U'' variation with y, were processed by the Landahl program[24], slightly modified for greater accuracy in U''. The similar Falkner-Skan family of profiles, FS for short, has been processed by the Wazzan-Okamura-Smith technique (WOS) and provides a contrast to the non-similar O family.

The results are presented and their usage illustrated in Figures 1-22, and in Tables I-VI. The FS stability characteristics are displayed in the traditional form of amplification and propagation speed diagrams, Figures 12 and 13 being directly comparable with Pretsch's results[22]. Most of the detailed stability data for the non-similar O families are presented in tabular form, Tables VI, which allow the user to perform his own interpolations more accurately than for any other type of presentation.

The user's main problem is to determine those profiles in the Portfolio which are closest to his profile of interest so that he may perform his numerical or graphical interpolations or bracketing. An efficient neighbor-identification relies on visual pattern recognition, at least in the first approximation. However, important differences between $U(y)$ distributions are often subtle and tend to escape the eye except on prohibitively large scales - see, for instance, Figures 1a-1d, where the differences are actually large and systematic. In conjunction with the free-stream and no-slip boundary conditions, distributions of $U''(y)$ determine fully both the $U'(y)$ and $U(y)$ profiles. Mosaics of readily overseen small-scale $U'(y)$ and $U''(y)$ distributions for all the velocity profiles in the Portfolio are displayed in Figures 2 and 3 respectively. From our (limited) experience, good matching of $U''(y)$ for $0.1 < y < 0.9$ seems to be the most reliable way of reproducing nearly identical detailed stability characteristics (see discussion in Section 3.1), no matter by what physical process the $U''(y)$ distribution was obtained. This behavior apparently reflects the role of the instantaneous vorticity distribution (see Lighthill[20] and Gill[29]) and of the inhibition of the disturbance velocity component v near the wall. In the identification process, the $U'(y)$ distributions of Figure 2 primarily add feel for the type of the profile and a secondary check. The corresponding U profiles, if desired, can then be obtained from Equation (A3) and the profile coefficients listed for the O families, and from References 68, 9, 70 and Section 4 for the FS family.

The main contents of the tables of stability characteristics for any identified profile are illustrated in Figure 4. In addition, phase and group velocities, c_r and c_g, of the propagating disturbances are given in Table VI for the O families, while c_r appears in Figure 13 for the FS family. These velocities are needed for relating the concepts of spatial and temporal instability. The basic definitions and inter-relationships of these two formulations are summarized in Table I, while the various levels of idealizations of amplifying disturbance fields are discussed in Sections 2.1 and 2.2. In particular, in Table I the reader can find a concise comparison between the features of the spatial and temporal stability, including the Gaster transformation which is useful in the tracing of the disturbance travel. There is a slight difference in the definition of c_r in the results of the O and FS families, occasioned by the different computer programs (see Note 2 in Table I).

Section 3 discusses the nature of the stability characteristics of profiles and presents some new insights, especially for profiles with inflection points. The usual correlation of critical Reynolds number with respect to a non-dimensional pressure gradient appears to

* Only two values of the dimensionless amplitude parameter N_A were investigated extensively, 0.075 and 0.15 (see Table V).

be restricted to severely constrained families of profiles. However, the correlation in terms of the shape factor H seems to be applicable even to non-similar boundary-layer developments (Section 3.4).

In Section 4, the contribution of WOS appears as a condensation of their earlier report[25]. The brief text guides the user through the similarity characteristics of the FS family presented in Figures 10-16.

Finally, in Section 5 the application of the local-constant-base formulation of the stability theory is illustrated for the especially difficult case of a boundary layer varying in x and (periodically) in t. Although the limitations of the basic assumptions are not yet clear, the theory apparently clarifies the hitherto puzzling experimental dichotomy of transition behavior in oscillating boundary layers[72]. The application of the same formulation to steady non-similar or similar layers reduces to a simplified subcase of the illustration in Section 5 (see also Reference 28).

2. SELECTED ASPECTS OF STABILITY THEORY

2.1 Temporal and Spatial Instability and Disturbance Input

The reader can readily find thoughtful derivations of the linearized stability equations, e.g. References 8, 9, 17-20, 23, and especially 22, in terms of either the disturbance stream function or the velocity component normal to the boundary, e.g.:

$$\left(U(y) - \frac{\omega}{\alpha}\right)\left(\frac{d^2}{dy^2} - \alpha^2\right) v_n - v_n U''(y) + \frac{i}{\alpha R}\left(\frac{d^2}{dy^2} - \alpha^2\right)^2 v_n = 0 . \tag{1}$$

The other velocity components and pressure can be derived from either the stream-function solutions or from the eigensolutions $v_n(y)$, $(n = 1,2,3,\ldots)$. We are concerned here primarily with various assumptions which influence the relationship between theory and experiment.

Strictly speaking Equation (1) for the infinity of eigenmodes $v_n(y)$ holds only for truly steady and parallel mean flows $U(y)$ of infinite extent, such as the plane Poiseuille flow. Then, two formulations of "initial" value problems for the disturbance velocity field – temporal and spatial – can be carried out, at least in principle (see Dunn[31] and Betchov and Criminale, Reference 8, p.123). Assuming Fourier-expandable stationary random functions in x or t, general solutions for the disturbance velocity fields, in particular for the normal velocity v, can be expressed in the two cases as linear superpositions of combinations of the eigensolutions (see Table I):

$$v(x,y,t;R) = \int_{-\infty}^{\infty} d\alpha_r \sum_n v_n(y;\alpha_r,R) e^{i(\alpha_r x - \omega_{rn} t)} e^{\omega_{in} t} ; \qquad \alpha_i = 0 \tag{2t}$$

$$v(x,y,t;R) = \int_{-\infty}^{\infty} d\omega_r \sum_n v_n(y;\omega_r,R) e^{i(\alpha_{rn} x - \omega_r t)} e^{-\alpha_{in} x} ; \qquad \omega_i = 0 . \tag{2s}$$

These representations are possible because Equation (1) is linear and its coefficients U and U″ are *independent of* x *and* t. The Fourier-eigenfunction coefficients within $v_n(y)$ in representations (2) can be determined in principle by linking these solutions to the corresponding essentially arbitrary "initial" distributions of disturbances at suitably chosen origins of t or x :

$$v(x,y,0;R) = \int_{-\infty}^{\infty} d\alpha_r \sum_n v_n(y;\alpha_r,R)e^{i\alpha_r x} \;; \qquad \alpha_i = 0 \tag{3t}$$

$$v(0,y,t;R) = \int_{-\infty}^{\infty} d\omega_r \sum_n v_n(y;\omega_r,R)e^{-i\omega_r t} \;; \qquad \omega_i = 0 \,. \tag{3s}$$

A rigorous proof of the completeness of the set of eigenfunctions for the plane Poiseuille flow which justifies the expansion of an arbitrary initial distribution in the temporal case, Equation (3t), was carried out by Schensted[33]. For most flows, the possibility of eigenfunction expansions of Equations (2) and (3) is simply assumed as plausible. However, the spatial initial value formulation (3s) should be regarded as an approximation, since the flow admits upstream influence, and a downstream initial condition is thus required to make the boundary value problem uniquely specified. However, since computations generally indicate no wave mode with upstream propagation, the upstream influence would generally be small and can be neglected, except within a small distance upstream of the downstream boundary.

Our concern with the preceding expansions stems, of course, from their relations to the effect of free-stream disturbances. If the Schubauer-Skramstad vibrating ribbon[1], of width $2l$, were placed at $y = y_0(x,t)$, $-l < x < l$, in a Poiseuille flow as a disturber, detailed disturbance information within the shear layer would be available for some fixed $x_1 > l$ and any $t > 0$. Therefore the spatial stability formulation, Equations (3s) and (2s) would be particularly suitable. Actually, hot-wire measurements at x_1 stations immediately downstream from a vibrating ribbon indicate rather complicated y and x variations at the basic driving frequency ω_d . In other words, the up-and-down motion of the ribbon generates not only the fundamental TS eigenfunction v_1 but many higher eigenfunctions as well. Fortunately, for steady mean flows, the higher eigenfunctions appear to be very stable whenever computed (see Reference 27 and references therein). Thus the traces of v_n for $n > 1$ vanish rapidly in the streamwise direction and only the fundamental TS mode - the main object of stability research - remains.

While the spatial stability formulation and the growth $e^{-\alpha_{1i}x}$ for $R > R_c$ fit well the special cases of active internal disturbances like the vibrating ribbon, it is not easy to identify the *actual* disturbance input into the TS modes on the normally idealized Poiseuille flow of infinite extent. Neither of the formulations appeals to our physical intuition, which is conditioned by boundary layers and channel flows with definite leading edges. Before Lin proved that plane Poiseuille flow could be unstable for $R > 5300$, the observed turbulence was "explained" by many as originating in the entrance length before the parabolic profile is developed. Similar explanations are still proposed for the origin of turbulence in axisymmetric Poiseuille flow (but see Reference 29 for an alternate view and recent results in References 55 and 56). However, as soon as we admit a mean viscous layer which develops in the x-direction, the coefficients in Equation (1) become weak functions of x and the simple Fourier decomposition in x is lost. Pretsch[22] and Benney and Rosenblatt[34] advance arguments for the validity of the local-constant-base formulation of Equation (1) as a first approximation, but the handling of the corresponding initial value problems apparently remains unsettled. The presence of a leading edge favors intuitive preference for spatial piecewise local-constant-base formulation of the stability problem but spoils clear connection between the mathematical theory of Equation (1) and the disturbance input.

Most disturbances are three-dimensional so that Fourier decomposition over the x-z plane, involving skew waves $e^{i(\alpha x + \beta z)}$ in Equations (2), would be generally called for. When Criminale and Kovasznay[35] and Benjamin[36] traced in this manner the downstream propagation and growth of such localized disturbances (neglecting the damped higher modes in Equation (2t)), a deeper insight into the relation between incompressible stability theory

and experiment was achieved. The generalized Squire transformation, e.g. Reference 18, p.514, relating the relative temporal amplifications and motions of the two-dimensional waves of Equations (2) and of the skew waves, makes two-dimensional results, such as those in this Portfolio, useful in the three-dimensional case.

Gaster[32,37-39] extended these concepts to the spatial formulation where the Squire transformation becomes truly complex. Using analytic continuation in the complex ω- and α-planes in a generalization of Equations (2), Gaster was ultimately able to derive intriguing asymptotic representations of downstream wave-packet development from a point-source disturbance, $v(x,0,z,t) = \delta(x)\delta(z)\delta(t)$ (Dirac delta functions), at the wall of a Blasius layer[38]. Insofar as one can interpret this perturbation of the *boundary conditions* or arbitrary superpositions of such perturbations as realistic physical disturbances, Gaster's results represent the special instances where the "internalization" of disturbances in the boundary layer as TS wave packets has been demonstrated (see Section 1.1).

Gaster[40] also proved that, for small rates of amplification, the frequencies of the temporal and spatial formulations are equal to a high order of approximation, and that the spatial growth is related to the time growth by the group velocity $c_g = (\partial\omega_r/\partial\alpha_r)_R$ (see also Table I). Consequently, both the phase and group velocities of the first TS mode are made available to the user of the Portfolio in Tables VI. In the preparations for the present report, Gaster's transformations[40] and related estimates were verified for a number of mean profiles, including some inflected ones, through separate computations of the temporal and spatial growth rates. The agreement was excellent for all cases, including one of the second eigenmode*. The departure from the Gaster rule for highly unstable profiles such as the separating FS profile, $\beta = -0.1988$, away from the neutral curve was not checked. It is known that, for free layers, the amplifications may exceed the small values postulated by Gaster and that temporal and spatial solutions may not be simply related[57].

2.2 Free-Stream Disturbances and Boundary-Layer Receptivity

Kovasznay's concepts[81] of three independent modes of free-stream fluctuations, the temperature-density-entropy mode, the vorticity mode, and the sound mode, are discussed in a more expository manner in References 41 and 42. For the present purposes we wish to focus on their manner of propagation and contrast these with the propagation of TS waves which they presumably excite or feed. The scaler temperature-density mode is not expected to be truly important at low speeds (except in the case of large amplitudes), but it illustrates disturbances which travel along streamlines with essentially local flow velocity, while slowly diffusing away from these streamlines. These modal disturbances would thus be ingested into the boundary layer (say, of an aircraft flying through inhomogeneous temperature-density fields) primarily because the layer grows in x (a feature idealized away in the stability theory).

The vorticity-turbulence mode in the lowest approximation propagates in a similar manner, but because it is a vectorial entity, it should respond differently when it enters the shear layer and becomes distorted and stretched. The effectiveness of this form of turbulence input in generating TS waves is unknown. However, Hall's experiments[43] indicate that the turbulent wake from a passive disturbance element held above the layer (his region III) can penetrate without much effect through the upper half of the boundary layer and then suddenly trigger the formation of a turbulent spot. For such large disturbances, the TS process may be completely bypassed.

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* The interested reader is invited to compare the spatial amplification rates obtained directly and those obtained through the Gaster transformation of temporal rates for profiles such as (0.15, 2.5, π). An example of the transformation of higher mode eigenvalues can be obtained from profiles (0.075, 5.06, $\pi/2$). In this example the reader will note that a crossing of first and second mode amplification rates occurs in the spatial formulation but *not* in the temporal formulation.

According to Klebanoff's recent measurements[44], another turbulent agent, namely the pressure fluctuations associated with *external* vorticity traveling at essentially free-stream velocity above the layer, can probably disturb the boundary layer *across streamlines* significantly enough even at free-stream turbulence levels as low as u'/U of 0.2%. A mathematical treatment of such disturbances would require the solution of the Orr-Sommerfeld equation with non-homogeneous boundary conditions specified at the edge of the boundary layer. Insofar as the Fourier transform of the boundary condition would involve only wave trains with phase velocities equal to the free-stream velocity, no TS wave can become excited through the linear process in the parallel flow formulation, since the unstable waves have phase velocities of one third to one half of the free-stream velocity. This reasoning breaks down when non-parallel flow effects are included, and in particular near the leading edge of the boundary layer, since then the transient effect will generate and feed into the boundary layer all wave numbers and wave speeds, including those within the unstable range. Apparently, only a portion of the disturbance field is assimilated in the layer as growing TS wave packets even when the disturbance frequency spectrum falls in the amplified range. Another significant portion apparently travels within the boundary layer without interaction with the TS mechanism. We must therefore carefully qualify statements to the effect that a given disturbance excites or feeds TS waves: the boundary layer seems to exhibit variable receptivity with respect to external disturbances.

The distinction can perhaps be made most easily in the case of the irrotational mode of disturbances: sound. In low-speed aerodynamic facilities sound disturbances travel at speeds an order or two of magnitude faster than the TS waves and tend to remain correlated over long distances[45]. At any given time chosen as $t = 0$, the distorted acoustic field within the boundary layer could be considered as the initial distribution for the TS system, as in Equation (3t). However, in the next instant most of this field would not develop according to Equation (2t), corresponding to the slow TS propagation speeds, but would be displaced with the speed of sound. In other words, sound tends to run through the TS field as a series of short-lived superposed plus-minus deviations. And yet, sound of a frequency ω_d is known to generate regular, coherent TS waves of the same frequency (but vastly different wavelength) rather efficiently (e.g. References 1 and 4), i.e. the boundary layer has a non-zero receptivity with respect to acoustic disturbances of ω_d in the amplified TS range. In the case of a low-speed two-dimensional jet, G.R.Brown[46] showed that the receptive region of the shear layer was localized at the lip of the opening slit by demonstrating the absence of any response to sound irradiation except when the sound was allowed to penetrate directly into this region. This is in accordance with the explanation already alluded to, in which the excitation is due to transient effects near the leading-edge region because of non-parallel flow effects. No corresponding result is available for attached boundary layers.

Instead of visualizing the effect of disturbances in terms of the initial value problem, it is possible to view their action as due to disturbance forcing functions driving a TS response. This approach was abandoned in the 1950's and is currently being reconsidered (Refs.47 and 48). Criminale[47], *after* obtaining the linearized equivalent of Equation (1), adds a "known function of space and time", $V(x,y,z,t)$, to the right-hand side, making the equation non-homogeneous. Presumably this known function should depend only on the forcing modal disturbances and the mean flow, but such specifications were postponed for later research. The difficult enough mathematical problem of the response to a non-moving delta function at x_0, y_0, z_0, i.e. the determination of the Green's function for this non-self-adjoint system, was first tackled in Reference 47. Thus far, there is no indication how the problem of cohesive disturbance fields, such as free-stream turbulence or sound, which travel at characteristic speeds different from that of the responding TS waves, will be resolved.

A concrete illustration of the associated conceptual difficulties and of some complicated responses is provided by Grosch and Salwen[27] for the case of a two-dimensional incompressible Poiseuille flow, perturbed by an oscillating pressure gradient of arbitrary dimensionless amplitude Λ and driving circular frequency ω_d. Because of the linearity of the

Navier-Stokes equations for parallel flows, the cohesive disturbance field is exactly and explicitly determined in this case and consists of an irrotational oscillating plug flow independent of x and y and of the oscillating shear waves diffusing away from the walls where they are generated by cancellation of the plug-flow velocities according to the no-slip conditions. (This disturbance can be interpreted as an incompressible limit of a sound wave disturbance, i.e. the aforementioned very large ratios of the sound speed to TS velocities and of the respective wavelengths can be idealized as approaching infinity.) The *linearized* forcing-function approach fails in this case: linearization of the Navier-Stokes equations for the combined mean flow, forcing disturbance flow and TS disturbance response, yields zero for the right-hand side of the equivalent of Equation (1) just as if there were no forcing disturbance, i.e. the function V of Criminale vanishes. However, if the product of the forcing disturbance and the TS response is kept, a more general homogeneous Equation (1) (with a modified time operator), still linear in the TS-type disturbances, arises. It incorporates a more general "mean flow" $U(y,t)$ (made up of the Poiseuille flow and the forcing harmonic disturbance of frequency ω_d) and its derivative $U''(y,t)$ in place of the terms $U(y)$ and $U''(y)$ in Equation (1). Grosch and Salwen[27] seek the temporal stability characteristics of this generalized, linear, time-dependent homogeneous TS problem. They assume that there exists a complete set of solutions $v_n(y,t)e^{\sigma_n t}$ (where eigenmodes $v_n = -i\alpha\phi_n$ are now periodic in t and $\sigma_n = +i\alpha c_n$, a change of sign from the present notation) and proceed to find the eigenvalues by matrix methods for a few wave numbers α and Reynolds numbers R as dependent on the driving frequency ω_d and amplitude Λ.

In contrast to a linearized forcing-function approach, which, if successful, would lead to a linear response in the amplitude of the forcing disturbance Λ, the Grosch-Salwen formulation yields a non-linear Λ dependence. In fact, for specific instances of disturbance frequency, ω_d, chosen to fall in the unstable TS range for $\Lambda = 0$, the first mode of the TS response field stops growing and damps out as Λ increases from 0 (Figures 11 and 12 of Reference 27). (For Λ values corresponding to velocity amplitudes $\Delta U/U_{max}$ on the order of 0.1, a rather puzzling destabilization takes place, attributed somewhat vaguely to a rapid change in the third or a higher eigenvalue with Λ.) Furthermore, for the same α-R neighborhood, the TS response at constant disturbance velocity amplitude $\Delta U/U_{max}$ also becomes more stable as the frequency ω_d varies from $0.38\omega_1$ (ω_1 referring to the most unstable first TS mode for $\Lambda = 0$) and reaches maximum stability at $\omega_d \simeq 1.2\omega_1$ (Figure 10 of Reference 27). Grosch and Salwen interpret these stabilization effects in terms of "interference" between the driven shear waves and the TS shear waves.

Viewed in terms of the limit of sound disturbance already mentioned, these results are not incompatible with the cited experiment of G.B.Brown[46], where positive shear-layer receptivity was confined to a small region of an x-dependent mean flow. Here, the base flow is x-independent, and the idealized sound waves travel at infinite speed with respect to the TS waves even when they have comparable frequencies. The physical situation differs from any we may visualize for resonant response conditions. According to the computations (which should be checked in view of the higher mode anomaly for high Λ), the Poiseuille shear layer apparently possesses *negative* receptivity with respect to idealized acoustic disturbances. We recall that, experimentally, the x-dependent Blasius layer has a positive receptivity (Refs.1 and 4), which is maximal when ω_d falls in the range of most amplified TS wave frequencies!

2.3 Non-Linear Effects

The foregoing discussion was based on ideas adapted from the linear theory. However, this approach clearly fails to explain adequately the observed excitation of the unstable TS modes in many situations, even if the effects of non-parallel flow are accounted for. Inclusion of non-linearity greatly increases the complexity of the analysis, as is clear from a glance at the literature on the non-linear stability theory. However, a fairly simple qualitative discussion bringing forth the most essential points is nevertheless possible. A suitable starting point is the formulation of the unsteady perturbation

problem presented by Landahl[60] for the purpose of studying turbulent pressure fluctuations. Within the parallel flow assumption the equations of motion may be combined to give

$$\left(\frac{\partial}{\partial t} + U\frac{\partial}{\partial x}\right)\nabla^2 v - U''\frac{\partial v}{\partial x} - \frac{1}{R}\nabla^4 v = q(x,y,z,t) \; , \tag{4}$$

where

$$q = \frac{\partial T_2}{\partial x_1^2} - \frac{\partial}{\partial x_2}\left(\frac{\partial T_1}{\partial x_1}\right), \qquad x_2 = y$$

and

$$T_i = \frac{\partial}{\partial x_j}\left(\overline{u_j u_i} - u_j u_i\right) .$$

Thus, the linear OS mode is, in this formulation, considered to be driven by the "fluctuating Reynolds stresses". The driving function q is precisely the "known function of space and time" $V(x,y,z,t)$ introduced by Criminale[47]. Strictly speaking, this function can never be completely specified since its definition involves the unknown quantity v itself. However, for a qualitative discussion of non-linear effects it may be instructive to treat q as specified independently of v.

Consider now an initially quiet parallel flow in which a disturbance of amplitude ϵ (assumed small) and wave number α is somehow introduced at a particular instant, say $t = 0$. Through Equation (4) one is lead to a non-homogeneous initial value problem with the right-hand side being of order ϵ^2 and containing components of wave number 2α. A response will therefore be excited which will in the beginning contain wave numbers α and 2α. In addition, the Reynolds stresses created by the disturbance will cause a change in the mean flow of order ϵ^2. The perturbation components of wave numbers α and 2α will in turn through the non-homogeneous term q produce further responses of wave numbers α and 3α and of amplitude of order ϵ^3. For each wave number component one will then, upon Fourier transformation in time, obtain a non-homogeneous Orr-Sommerfeld (OS) equation which may be treated formally through expansion in terms of eigenfunctions of the adjoint problem. The solution for the Fourier transform thus obtained will have poles at the frequencies for the Orr-Sommerfeld eigenvalues yielding upon inverse transformation OS wave modes of amplitude of order ϵ^3.

The disturbance velocity development in a flow with small unsteadiness may be discussed in a similar manner. Assume that the initial unsteadiness is of amplitude δ and wave number α_0. Upon this, a disturbance of amplitude ϵ and wave number α is imposed such that $\epsilon \ll \delta$. Because of q, the response will contain wave numbers of $\alpha + \alpha_0$ and $\alpha - \alpha_0$ with amplitudes of order $\epsilon\delta$. This in turn will, after interaction with the initial unsteadiness, lead to perturbations of wave numbers α and $\alpha + 2\alpha_0$ and amplitude of order $\epsilon\delta^2$. Hence the third-order interaction will produce corrections of the same wave number as the imposed one. The corrections will be linear in the imposed amplitude, ϵ, but the proportionality factor will be of order δ^2. The non-linear effects will thus produce a boundary-layer receptivity which, although small, may be important if the linear part is small or zero.

By moving some of the non-linear terms to the left-hand side of Equation (4), one could write it alternatively as

$$\left(\frac{\partial}{\partial t} + U_1\frac{\partial}{\partial x}\right)\nabla^2 v - U_1''\frac{\partial v}{\partial x} - \frac{1}{R}\nabla^4 v = q_1(x,y,z,t) \; , \tag{5}$$

where $$U_1 = U + u , \qquad U_1'' = \frac{\partial^2 U_1}{\partial y^2}$$

and $$q = q + u\frac{\partial}{\partial x}(\nabla^2 v) - v\frac{\partial^2 u}{\partial y^2} .$$

In the quasi-steady approximation this equation is treated under the assumption that U_1 is independent of t and x. This is valid when the initial unsteadiness is of a frequency and wave number much smaller than for the imposed disturbance, the stability of which is studied. Specifically, the stability of small two-dimensional perturbations of an oscillatory flow may be studied with the aid of Equation (5). Let the initial unsteadiness be given by u_0 , v_0 and superimpose perturbations u_1 , v_1 , such that $u_1 , v_1 \ll u_0 , v_0$. From Equation (5) one then obtains, upon neglecting terms of higher order in u_1 , v_1 ,

$$\left[\frac{\partial}{\partial t} + (U + u_0)\frac{\partial}{\partial x}\right]\nabla^2 v_1 - \left(U'' + \frac{\partial^2 u_0}{\partial y^2}\right)\frac{\partial v_1}{\partial x} - \frac{1}{R}\nabla^4 v_1 = \frac{\partial}{\partial x}\left[v_1\frac{\partial^2 u_0}{\partial x^2} + v_0\nabla^2 u_1 - u_1\nabla^2 v_0\right] .$$

When u_0 is independent of x , as in the case treated by Grosch and Salwen[27], the right-hand side is identically zero. When the wave number α_0 of the initial oscillation is much smaller than the wave number α of u_1 , v_1 , the right-hand side is small and can be neglected, thus justifying a constant-base-flow approach in the spatial case.

2.4 Wave Packets and Their Development in a Given Boundary Layer

Originally, we planned to recommend to the user of the Portfolio to (a) define his probable disturbance environment, i.e. the relative composition in terms of temperature, vorticity, and sound modes, wall vibrations, etc., including their respective spectral distributions, and (b), assuming that the receptivity corresponds to some simple transfer functions for the different types of disturbances, match the environmental spectra against the TS amplification spectra obtainable from the Portfolio. The recommendations still have merit, but the reader can perhaps appreciate, on the basis of the discussion of the previous Sections, that the present state of theoretical and experimental information on the effect of disturbance input precludes any definite statements concerning the receptivity of any previously uncalibrated shear layers. For practical boundary layers, developing in x , the presence of vortical or acoustic spectral energy in the range of amplified TS frequencies is still expected to be a danger signal, e.g. References 1, 4, 50 and 51.

We should remark that the recommended determination of the disturbance environment, modally and spectrally, represents a substantial undertaking. In fact, no complete decomposition can be found in the literature, which explains why we know so little of the effects of disturbances. Since the TS process often amplifies the disturbances by factors of thousands, the original amplitudes may be extremely small, almost subliminal with respect to our instruments.

With input amplitudes uncertain, we resort to characterization of monochromatic traveling disturbances in terms of the ratio of their amplitudes, A_2/A_1 , at two locations x_2 and x_1 , which are related through the group velocity of the times of observation $x_2 - x_1 = c_g(t_2 - t_1)$. (If the boundary layer changes rapidly, the stations 1 and 2 must be near enough to each other so that c_g remains nearly constant between them.) For the user's convenience, we recapitulate the basic definitions and properties of monochromatic spatial and temporal disturbances corresponding to the formulations of Equations (2) in Table I. The subscripts n , which denoted the order of the TS eigenmodes, are now dropped because generally only the first mode may be unstable and is therefore of interest.

Actually, most disturbances occurring in confined flows or in free flight possess enough randomness to be transformed by the TS selective amplifier not into steady monochromatic wave trains but rather into nearly monochromatic wave packets with occasionally as few as three or four wavelengths e.g. References 1, 2, 11, 50, 51, etc. Most often, the successive wave packets appear to be uncorrelated so that they can be treated independently. As a wave packet travels downstream, its spectral distribution $S(\omega_p)$ slowly changes and, in particular, the frequency ω_m corresponding to the maximum of $S(\omega_p)$ shifts slowly with x . For a Blasius layer, the favored frequencies correspond roughly to wavelengths from seven to ten times the local boundary-layer thickness. A wave packet may thus extend from twenty to seventy or more layer thicknesses, forming a sizable disturbed spot. Since such TS disturbance spots must be distinguished from the other spots in transition literature - the growing turbulent spots of Emmons[58] - we occasionally refer to the former as disturbance wounds.

According to the local-constant-base hypothesis (Sec. 1.1), the formulae of Table I apply locally to wave packets traveling through even non-similar mean profiles which develop in x or t slowly in relation to the growth of the disturbances. If, for a steady layer, we had available stability characteristics for profiles located Δx_k apart, we could piece together successive increments in amplitude $A(\omega_p)$ of any frequency, ω_p , in the wave packet

$$\frac{\Delta A_{kl}}{A_k} = \left(\frac{\alpha_r c_i}{c_g}\right)_k \Delta x_{kl} = -(\alpha_i)_k \Delta x_{kl} . \tag{6}$$

and trace the growth of $A(\omega_p)$ along the length of the layer, such as that along a wavy wall[7]. As the wave packet passes from one mean profile to another, the traced changing amplitude in Equation (6) remains associated with the same frequency ω_p , while the wavelength changes as the layer thickness varies. However, as the ω_p- and R-dependent amplification progresses along the wave packet trajectory, the frequency ω_m of the maximum of the spectrum of the packet shifts with increases in x and with shape changes in the mean profile. Thus the most amplified frequency in a wave packet may well shift 20%-30% along its trajectory and some locally highly amplified frequencies may decay and become "quenched" at downstream stations. (See also Jaffe et al.[28].)

For unsteady boundary layers Equation (6) may be applied, but the stability characteristics at the successive locations must be those of the local profiles which occur at the instant when the disturbance arrives at each x . In other words, the x- and t-dependent profiles must match the x-t trajectory of the wave packet. The procedure may be computationally involved but is nevertheless conceptually straightforward. It is illustrated in detail for the user in Section 5, using a specific example of a flat plate in an oscillating stream, for which there is some experimental information. The reader should experience no difficulty in simplifying the graphical procedures of Section 5 to steady boundary layers. To find total amplification, integration of Equation (6) is required, and except for strictly parallel flows, graphical integration offers both simplicity and feel for the growth characteristics.

2.3 Assessment of Transition Location

As we trace the growth of wave packets, sooner or later we must reach stages (a) where the linear theory ceases to be valid, (b) where the boundary layer becomes locally turbulent (i.e. experiences a local breakdown and nourishes a growing turbulent spot), and (c) where the growing turbulent spots increase in number and spread into the neighboring laminar flow until the flow is fully turbulent. We refer the reader to overall descriptions of the non-linear phenomena and final breakdown to turbulence in References 21, 52 and 13, and confine our comments to approximate criteria of transition which could be grafted onto the linear information in the Portfolio.

According to Klebanoff et al.[13], stage (a) occurs for a monochromatic artificial excitation when the maximum root mean square streamwise velocity fluctuation u' within the flat-plate layer reaches 1 to 1.5% of U_e. Since contributions from other frequencies are added in the square (non-correlated signals), the cessation of linear TS behavior for non-monochromatic disturbances could take place for slightly higher, but not much higher, u' values. To fix ideas, consider spectrally integrated free-stream disturbance levels u'/U_e in modern wind tunnels on the order of 0.001. As much of the disturbance energy is damped out or becomes irrelevant in the filtering TS mechanism, we should not be surprised if the internalized narrow-band fundamental TS mode had a maximum of u'/U_e at least a hundred times smaller, i.e. on the order of 0.00001 or less at the x station corresponding to its R_c. Even contributions at the ultimately dominant TS frequency must be diminished by the receptivity factor and by the "waste" through damped higher eigenmodes. Then, according to Klebanoff's results the total amplification ratio on the order of 1000 or more between R_c and the onset of non-linearity would be expected. For higher levels of free-stream disturbances or for input spectra favoring the dangerous frequencies, the amplification ratio would be correspondingly less. (For Bennett's[51] high free-stream disturbance level of 0.0042, an amplification ratio of about 500 was estimated from the measurements[54] to accrue between R_c and the beginning of transition.)

In stage (b) the first appearance of turbulent spots, i.e. the beginning of the true transition region, is expected[16] at $u'/U_{e\,max}$ levels on the order of 0.12 to 0.20. Thus an additional amplification factor of 10-15 beyond the onset of non-linearity must be incurred by the three-dimensional non-linear mechanisms and by the secondary inflectional instability over flat plates[21,13]. If this flat-plate information were sufficiently typical, the x-range of linear amplification would tend to "control" the distance to the beginning of transition. Errors in estimates of the extent of the non-linear pre-breakdown regimes would cause small percentage errors in estimates of the total length to the beginning of transition. We note, however, that nothing is known about the influence of pressure gradients on these two non-linear mechanisms.

In stage (c) the ultimate conquest of the disturbed laminar regions by turbulence depends upon the density of seeding of the turbulent spots. Since the angles of their spanwise growth are nearly constant, the length of the transition region itself is partially predictable[58,61]. Empirical information from wind tunnels[62] provides further means for estimates of the extent of the transition region, although its generality is yet to be established. In particular, some knowledge of variations in the space-time density of local breakdowns with changes in calibrated disturbances (turbulence and sound) in non-vanishing pressure gradients and their influence on the length of the transition region is desirable before reliance can be placed on such semi-empirical estimates.

The growth ratio leading to stage (a) should follow linear TS theory, which does account for effects of pressure gradients and also predicts reliably the dependence on Reynolds number. The processes associated with stages (b) and (c) are apparently inertially controlled (not unlike turbulence itself) and should be essentially R-independent. Both the linear and non-linear processes seem to be affected by even mild three-dimensionality of the mean boundary layer.

Satisfactory assessment of the *beginning of the transition* region for approximately two-dimensional boundary layers would require at least three elements: (A) adequate knowledge of the disturbances in the given environment and of the corresponding boundary-layer receptivity; (B) knowledge of the development of the mean profiles, access to their stability characteristics, and computation of the maximum amplification ratios as function of ω and x; (C) empirical information on the length of the non-linear processes and secondary instability as dependent on pressure gradients and other parameters. This Portfolio deals with element (B) which often governs 75%-85% of the *distance* to the beginning of transition. For design purposes we could make bracketing estimates of elements (A) and (C) and arrive at reasonable lower and upper bounds for R_t (beginning). Elucidation of the degradation of design performance corresponding to the lower bound should provide a better basis for subsequent design decisions than the customary deterministic correlation estimates of R_t.

Simultaneous appreciation for the factors governing the spread between the upper and lower bound (entering mainly through elements (A) and (C)), and for the desiderata and risks of the design would appear as necessary for a rational design approach.

In his review, Tani[21] devotes a section to "Prediction of Transition", and refers in particular to Van Ingen[63], whose report was not available to the present authors, and to Smith[53], who, together with Jaffe and Okamura, has just come out with a computerized prediction technique[28]. Smith[53] started with an analysis of factors involved in the transition process and adopted Liepmann's hypothesis[2b] for the breakdown to turbulence, namely that the Reynolds stress due to the amplified fluctuations become comparable in magnitude to the maximum mean laminar shear stress in the boundary layer. Smith reduced the criterion to a rather explicit dependence on the local laminar skin friction coefficient, the disturbance input at the neutral point, R_c , and the total amplification ratio from the neutral point on. His study of available information on transition of attached boundary layers disclosed an empirical variation of the ratio of the amplitude at transition to that at the neutral point A_t/A_c from $e^{4.2}$ to $e^{20.9}$, which, however, appeared primarily modulated by the level of initial disturbances. By confining himself to wind tunnels with low turbulence and to flight tests (for which the disturbances are usually low) and by replacing our element (C) of non-linear processes with continued "equivalent" linear amplification, Smith and Gamberoni arrived at an empirical correlation of e^9 ($\simeq$ 8100) for A_t/A_c in Reference 53, while the more sophisticated computations in Reference 28, although making use of a smaller number of test cases, suggest a factor of e^{10} ($\simeq$ 22000) . Our earlier estimate for the non-linear, pre-breakdown amplification was a factor of 10 to 15, i.e., $e^{2.3}$ to $e^{2.7}$, indicating that, for the low-disturbance transition, the prolonged TS amplification by factors on the order of e^7 ($\simeq$ 1100) indeed appears to control the major part of the development to the beginning of transition. Since in most of the cases available for comparison in References 53 and 28 the beginning and the end of transition are not well defined, we should reserve judgement with respect to the specific numbers cited.

An attempt to apply any predictive techniques to the results in Figure 1 of Reference 4, where artificial mixtures of vorticity and sound disturbances lead to currently uncorrelatable transition locations, should convince us that knowledge of the receptivity of the boundary layers to rotational and irrotational disturbances is indispensible for further progress and that both the modal and spectral characteristics of input disturbances play an important role. Most low-disturbance wind tunnels, such as that of Schubauer and Schramstad[1], actually harbor an unknown mixture of turbulence and sound, which is improperly characterized by a single u'/U_e number. Conversely, flights are not free of sound disturbances either - the propulsive systems tend to generate substantial acoustic disturbances, e.g. Reference 64. However, not until the spectral input is known can we truly judge its overlap with the part of the spectrum which is dangerous for any given cruising conditions, a judgement well within the scope of the linear theory and the Portfolio. The case for increased attention to the element (A) seems to be strong.

Throughout this discussion of estimates of transition location it was tacitly assumed that there were no competing non-TS mechanisms of transition present. When transition is caused by three-dimensional roughness, entirely different criteria must apply (see Tani[21] for guidance). Similarly, if the mean boundary layer is sufficiently three-dimensional, such as on most wings swept back more than 20°, a different instability, faster than the normal TS mechanism, arises leading to formation of streamwise vortices in the boundary layer (see References 18, 19 and 16). Two-dimensional roughness can apparently be treated within the TS framework[16], but good correlations are probably more practical[21]. On the other hand, wall waviness, which is suspected of strong destabilizing effects, can now be analyzed by the local-constant-base treatment of Jaffe et al.[28]. Judging by the results of Reference 7, the probable local inflected profiles act as strong amplifiers and thus contribute to the observed earlier transition.

We end this Section with a demonstration of a so-called unit-Reynolds-number effect (which is frustrating the students of supersonic transition[5,67]) in terms of *linear* stability theory for a low-speed wind tunnel[65]. For a given member of the FS family, such as the Blasius layer, the corresponding Figure 10j provides the "amplification ridge" in terms of the ordinate $\omega_r\nu/U_e^2$ and the abscissa $U_e\delta^*\nu$, or $\omega_r/\nu R_L^2$ and $\delta^* R_L \simeq R_L^{\frac{1}{2}} x^{\frac{1}{2}}$, where R_L stands for the unit Reynolds number U_e/ν . If at the same R_{δ^*} or R_x we compare two Blasius boundary layers, B_1 and B_2 , such that $U_{e2} = \sqrt{10}(U_{e1})$ and $\nu_1 = \nu_2$ (as appropriate at low speeds), we find that the neutral curve of the thinner boundary layer B_2 corresponds to dimensional frequencies ten times as high as those along the neutral curve of B_1 . The spectrum of dangerous TS frequencies shifts by a decade and, unless the input spectrum and energy of the free-stream disturbances match the shift exactly, we must expect a unit-Reynolds-number effect. Sound frequency in wind tunnels almost surely does not scale with R_L^2 . The energetic lower-frequency part of free-stream turbulence, which is controlled by non-streamlined "bodies" such as screens, would be expected to follow the inviscid Strouhal number scaling rather than the present viscous scaling of the TS waves. Actually, the amplitudes of measured free-stream disturbances in wind tunnels, u'/U , also vary with U_e and hence R_L – some rise steadily[1,66] and some pass through a maximum (resonance ?), e.g. in Brinich's low-speed settling chamber[67]. Thus we can suspect that many of the text-book correlations of low-speed transition Reynolds numbers hide a unit-Reynolds-number effect, since basic variables U_e and R_L are essentially proportional.

3. STABILITY CHARACTERISTICS OF THE PROFILES

3.1 Role of the Profile "Curvature", $U''(y)$

The only features of the boundary layer which enter the Orr-Sommerfeld equation, Equation (1), are the mean velocity variation $U(y)$ and its second derivative $U''(y)$. We recall that, with the boundary condition $U(0) = 0$ and $U(y) \to U_e$ as $y \to 1$, the profile "curvature", $U''(y)$, fully specifies the velocity distribution $U(y)$. Specification of any profile through its $U''(y)$ distribution is more than a mathematical convenience – it emphasizes the physical role of $U''(y)$, i.e. the rate of change of the mean vorticity (see References 20, 29 and 69). In the inviscid limit of the stability theory, a change of sign of $U''(y)$ within the layer constitutes both a necessary and sufficient condition of instability. When viscosity is considered, the effect of zero curvature is less definite, but, in general, the inflected profile has a higher amplification rate for the same frequency and Reynolds number than does an uninflected profile (e.g., compare Figures 13i-13*l*).

This fundamental role of U'' can be traced to the fact that, in the linearized vorticity equation, the term vU'' is directly related to the mechanism through which the fluctuating disturbance vorticity feeds on the reservoir of mean flow vorticity. Since the y-component of the disturbance velocity $v(y)$ in this product is small near the wall and near the edge of the layer, we could expect a lesser sensitivity of the stability characteristics to $U''(y)$ in these regions. In fact, this consideration together with somewhat limited numerical experience led to the earlier suggestion in Section 1.2 that good matching of the user's $U''(y)$ with that of a Portfolio profile over the more limited range $0.1 \lesssim y \lesssim 0.9$ allows him to use the detailed local stability characteristics of the Portfolio profiles as satisfactory approximations for his boundary layer. We recall that the readily overseen mosaic of small-scale $U''(y)$ distributions of all the Portfolio profiles available for such comparisons is displayed in Figure 3.

The preconditioning experience with similarity profiles has made most aerodynamicists associate the local $U''(y)$ distributions rather rigidly with the equilibrium pressure gradients, which act throughout the spatial development of the given boundary layer. For non-similar profiles, such as those along wavy walls[7] or those of unsteady boundary layers, the cumulative history of vorticity diffusion often leads to $U''(y)$ distributions and stability characteristics not in conformity with our preconceived ideas. It must therefore

be emphasized that, while in any given family of profiles the dimensionless $U''(0)$ value can be related to the instantaneous or local pressure gradient, the stability theory itself is *indifferent* to how a given distribution of vorticity, and hence of $U''(y)$, arose. Under the hypothesis of local constant base (Section 1.1), which must be invoked for *all* shear layers developing in x and/or t (whether similar or not), the instantaneous local $U''(y)$ distribution (and the boundary conditions) determine the local growth and propagation characteristics of the disturbance waves.

3.2 Boundary-Layer Profiles in the Portfolio

In this Section we shall view the data as a collection of stability characteristics generated from families of systematically varying profiles*. We shall discuss primarily the characteristics of two families of profiles: (i) the Falkner-Skan or FS family, a one-parameter self-similar set of profiles, the details of which are presented in many references, e.g. References 68, 9 and 70, and (ii) the Obremski or O family, a non-similar three-parameter set of profiles. Details of their construction are provided in Appendix A. We shall try to associate stability trends with changes in certain geometric properties of the profiles as well as with the physical parameters of the flow.

Since the profiles of the Falkner-Skan family are self-similar for each β, the dimensionless profile curvatures are obtainable directly from the basic differential equation (see Equations (11)). The y-distributions of U'' for the FS family are displayed in Figure 3c. For adverse pressure gradients, $\beta < 0$, the profiles exhibit an inflection point which moves away from the wall as β becomes more negative and is located where

$$F'''(\eta) = 0 . \tag{7}$$

At the wall, the similarity properties relate $U''(0)$ to the measure β of the pressure gradient, $U_{e\star}(dU_{e\star}/dx_\star)$, as follows:

$$U''(0) = -(\eta_\delta)^2\beta . \tag{8}$$

The preceding features of the FS family are sufficient for the discussion in this Section. Full information on the relevant properties of the mean FS profiles and on their stability characteristics, including computing procedures, is presented by Wazzan, Okamura, and Smith[25]. Section 4 of the Portfolio presents a condensed account of this information.

For the non-similar O families of profiles, the mosaics of Figures 3a and 3b portray the trends of the cross-layer distributions of profile curvature with the family parameters X_ω and Ω for the cases $N_A = 0.075$ and 0.15 respectively. Particular profiles of the O family will often be called out by their unsteady characteristics: (N_A, X_ω, Ω) . At the wall the second derivative can be interpreted as the instantaneous pressure gradient of an oscillating flow over a flat plate:

$$U''(0) = -36 N_A X_\omega \cos\Omega(1 + N_A \sin\Omega)^{-1} . \tag{9}$$

Values greater than zero indicate that the instantaneous pressure gradient is adverse while negative values correspond to a favorable gradient. The velocity at the inflection point and its position has been marked on the sketches of Figures 3 as the paired values (U,y).

Additional features of the O family, beyond the immediate interest of this Section, including all the computed stability characteristics, can be found in Appendices A and B and in Tables V and VI. An additional profile (0.042, 9.0, π) was analyzed for purposes of a comparison made in Section 3.3.

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* At the time of the writing of this report, no additional systematic information on amplification characteristics of families of profiles obtained numerically from the Orr-Sommerfeld Equations were known to the authors. Neutral curves (alone) for a series of divergent channel flows were published by Eagles[79], and for flat-plate layers in presence of foreign gas injection, applied magnetic fields, etc., by Powers and Heiche[80].

3.3 Stability Criteria and Location of Inflection Point

For a complete description of the two-dimensional stability characteristics of a given profile we should specify two functions, the spatial or temporal amplification rate and the corresponding propagation speed of the disturbances, as varying with Fourier parameters β_r or α_r and Reynolds number. This detailed information is contained in Tables VI and Figures 10 and 13. Clearly, this complete information is unwieldy and recourse to a simpler measure of stability is indicated for many purposes. The three-dimensional representation of the amplification information for a typical viscous-controlled instability, Figure 4, brings out some of these possible criteria: the minimum critical Reynolds number, the neutral curve and the maximum amplification rate (Refs. 18, 19). For inflected profiles, the inviscid asymptotic non-zero values α_r or β_r and the maximum amplification rates for $R \to \infty$ often provide additional useful characteristics. The preceding "discrete" instability criteria emphasize different aspects of the overall information (Fig. 4) and at times lead to contradictory judgements on relative instability profiles*. Nevertheless, if applied cautiously, with understanding of their limitations, such criteria are very useful for specific objectives.

In view of the fundamental role of the U'' distribution, we inquire into its possible relationship to the simplest stability criteria of critical Reynolds number. In Figure 5, the $\log (R_{\delta *})_c$ has been plotted against X_ω with Ω as parameter for $N_A = 0.075$. The profiles corresponding to $\Omega = \pi$, $5\pi/4$, $3\pi/2$ and $7\pi/4$ achieve their *minimum critical Reynolds* numbers at the identical values of X_ω *where their inflection points* are *farthest* from the wall (see Figure 3a). These profiles include those for which the curvature at the wall is positive (destabilizing) (π, $5\pi/4$), zero ($3\pi/2$) and negative (stabilizing) ($7\pi/4$). On the other hand, the $\Omega = 0$ profile, not only has no inflection points but exhibits a large "stabilizing" curvature at the wall, and yet a large decrease in critical Reynolds number occurs for $X_\omega > 5$.

This destabilization is probably associated with the development of the near zero curvature condition away from the constraining effects of the wall. A similar development takes place for $\Omega = 7\pi/4$, $X_\omega > 2.5$, and can be expected for the $\pi/2$ profile for $X_\omega > 9$ (see Figure 3a).

From this discussion we see emerging a qualitative correlation between the distance of the inflection point from the wall and the critical Reynolds number, quite apart from the sign of the wall curvature $U''(0)$. This trend is consistent with the variation of critical Reynolds number for the FS family (Fig. 11). There, however, the inflection-point location is rigidly tied to $U''(0)$ through the similarity relations so that the trends are usually interpreted in terms of the pressure gradient. As an experiment, stability characteristics of three profiles of the 0 families with the identical value of $U''(0)$, namely 13.6, were computed and are displayed in Table II. We see from the corresponding $U''(y)$ distributions in Figure 6 that the "high" profile, H, exhibits the highest negative curvature which might be superficially considered as stabilizing. However, on the basis of minimum critical Reynolds number, H is the most unstable of the three profiles. It could perhaps be described as the most inviscid in behavior in that its inflection-point location is closest to its critical layer, columns 3 and 4 of Table II. Actually, at the minimum Reynolds number and up to the peak in the amplified wave number, Figure 13n, the destabilization mechanism appears to remain viscous in nature. Furthermore, the "low" profile, L, has its inflection much closer to the critical layer than does the Blasius profile and yet L is the stabler of the two! Such counter-trends underscore the observation that, although correlations with acceptable scatter may be achieved, deeper explanations are lacking.

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* An important example occurs when compressibility effects are included. As Mach number increases from zero, both R and maximum amplification rate decrease, i.e. the ridge in Figure 4 shifts somewhat to the left as its slopes become less steep. The "discrete" criteria of R_c and $\alpha_{i\,max}$ have opposite trends and only consideration of the integrated amplification history can settle whether the net effect is stabilizing or not.

In order to bring out more clearly the roles of $U''(y)$ and of the location of the inflection point, $\log (R_{\delta\star})_c$ has been plotted, in Figure 7, against the velocity at which the inflection occurs. For the O families, data has been included from both values of the amplitude parameter N_A. Point B corresponds to the critical Reynolds number for a Blasius flow, $\beta = 0$, and four other FS members are indicated by their β values. No data are presently available with inflection points lying between velocity ratios of 0.0 and 0.23.

The correlation appears meaningful when the inflection point is sufficiently removed from the wall, i.e. $U|_{U''=0} > 0.23$. However, the spread of data when the inflection point is at the wall suggests that its influence when in proximity of the constraining wall may be overriden by other characteristics of the $U''(y)$ distribution. From Equation (9) and Figure 3a we note that the inflection point remains at the wall for all members of the O families when $\Omega = \pi/2$, and from Figure 7 we see that all of these profiles are more stable than the Blasius profile. The reader may compare the $U''(y)$ distributions of Figures 3 to acquire first-hand feeling for the rather subtle variations which influence the relative stability of profiles. In fact, comparison of $U''(y)$ distribution of the $\Omega = \pi$, $X_\omega = 9.0$ inflected profile in Figure 3a with the less stable (!) Blasius distributions ($\beta = 0$) of Figure 3c teaches us the caution mentioned previously concerning over-simplified stability characterizations.

To deepen our appreciation of the intrinsic factors, the slope (mean vorticity) distributions $U'(y)$ for the preceding two profiles as well as for the O profile for $\Omega = 0$, $X_\omega = 9.0$, $N_A = 0.075$ are portrayed in Figure 8 (see Figure 16 for $U(y)$). This latter profile, the only one in Figure 8 without an inflection point, is the most unstable of the three. From Table VI we can ascertain that the (0.075, 9.0, 0) profile displays a greater vulnerability to high frequency disturbances $\beta_{r\star}\nu_\star/U_{0\star}^2 = (\simeq 380 \times 10^{-6})_c$ than does the (0.075, 9.0, π) profile $(\simeq 180 \times 10^{-6})_c$. Spatial growth rates at intermediate Reynolds numbers are generally lower for the (0.075, 9.0, 0) profile and their decline with frequency is less precipitous resulting in a less "spiney" topography for the stability ridge in Figure 4. The differences between the velocity profiles themselves are small and *could well be missed experimentally* without special precautions. If Quick and Schröder's[7] mean profile computations over a wavy wall can be used as an approximate guide, profiles similar to the three above must be expected over walls with mild wall undulations. The empirical destabilizing effect of wall waviness noted by Smith and co-workers[28,53] may thus be predictable, at least qualitatively.

A glance at the curvature mosaic in Figure 3a discloses that some members of the O family exhibit two inflection points. The presence of the inner inflection point seems to have very little influence on the stability characteristics of these profiles. This behavior is consistent with the remarks concerning the insensitivity of $U''(y)$ distribution below y of approximately 0.1 in Section 3.1.

3.4 Correlations of Minimum Critical Reynolds Number of Non-Similar Profiles

The minimum critical Reynolds number has traditionally been a simple measure of stability and many attempts have been made to correlate it with some physical or geometric parameter combination. Two popular correlating factors, which attempt to introduce weighting of the $U(y)$ profile are the "improved" Pohlhausen parameter of Holstein and Bohlen[49]:

$$\lambda_2 = \frac{\theta^2}{\nu}\frac{dU_e}{dx} = -\left(\frac{\theta}{\delta}\right)^2 U''(0) \tag{10}$$

and the shape parameter $\delta^\star/\theta = H$. Examples of these pre-computer correlations are found in Stuart's review[18] and other sources, References 19, 9, etc. Both of these parameters provide a reasonably good correlation of critical Reynolds number for steady favorable pressure gradients, but appear less satisfactory when the pressure gradient is adverse.

The attempted extension of the λ_2 correlation to the non-similar profiles of the 0 families yielded such poor results that it is not even shown. The reason for this failure undoubtedly stems from inadequate weighting of the profile through the insensitive factor θ/δ in the dimensionless expression for λ_2 in Equation (10). We have already seen that $U''(0)$ alone does not characterize the instability tendencies of non-similar profiles.

It is gratifying that the simple shape parameter δ^*/θ apparently does represent satisfactory weighting of the properties of even non-similar profiles (see Figures 9a and 9b). By identifying the individual profiles for $N_A = 0.075$ between Figures 3a, 5, and 9a, the curious reader can recognize some reasons for the remaining scatter. The solid curves in Figures 9a and 9b correspond to Lin's approximate formula for $(R_{\delta*})_c$ (e.g. Reference 18), which is based on asymptotic methods for high αR and the assumption of small α. Both of these assumptions become less valid for profiles with inflection points so that the departure of the curves from the data above δ^*/θ of about 2.6 is understandable. The dotted curves OM are proposed as an empirical correction to Lin's curves. Based on accurate computer calculations of the Orr-Sommerfeld equations, they provide as good an estimate as can be expected in view of the probably irreducible scatter. Alternately, we could draw a curve through the results of the self-similar FS family in Figures 9 – which in fact does not differ appreciably from the proposed dotted curve.

The scatter in Figures 9a and 9b is not due to errors but rather to the sensitivity of the eigenvalue problem to variations in $U''(y)$ distribution which are hardly detectable from the integrated velocity profiles $U(y)$ themselves. Since the physical validity of the linear Orr-Sommerfeld equations for r.m.s. velocity fluctuations below 1% of U_e is beyond doubt (Klebanoff et al.[13]), this sensitivity should be expected to lead to "experimental" scatter as well. The experimental determination of a velocity profile in a given physical realization relies on discrete measurements with finite temporal and spatial resolution so that existent $U''(y)$ variations tend to be reduced by local averaging. Furthermore, evaluation of the required second derivative from discrete data introduces significant errors, especially near $y = 0$ and 1. Thus if we consider the highly desirable attempts to compare theoretically and experimentally determined stability characteristics of non-similar boundary layers we must recognize that the measured $U(y)$ and $U''(y)$ distributions, which are fed into the theory, may not correspond to the actual profiles for which amplification, R, etc. may have been obtained. Inaccuracies in $U(y)$ and $U''(y)$ determinations may cause significant discrepancies, especially near changes in the sign of $U'''(y)$. For instance, finite resolution of instruments could well change the U'' distribution of the profile (0.075, 9.0, 0) into that of (0.075, 5.06, 0) in Figure 3a, thus inducing a change in $\log (R_{\delta*})_c$ from 2.68 to 3.3 (see Figure 5) – a sizable error.

4. CHARACTERISTICS OF THE FALKNER-SKAN PROFILES

In Section 3.2, a few properties of the FS family, needed for the discussion of the stability characteristics in Sections 3.3 and 3.4 were mentioned. This chapter broadens the mean-flow information and reports on the spatial stability of the FS similarity profiles for which the characteristic equation is solved in terms of real values of ω and complex values of α. This then restricts the values of c to be proportional to the complex conjugate of α. In this case the following relations hold between α, c and ω:

$$\begin{aligned} \alpha_r c_r - \alpha_i c_i &= \omega_r , \\ \alpha_i c_r + \alpha_r c_i &= 0 . \end{aligned} \qquad (\omega_i = 0) \qquad (11a)$$

In the present investigation the linear independence of solutions to the Orr-Sommerfeld equation is maintained during the course of the integration by the Gram-Schmidt orthogonalization procedure[25,28] rather than the purification scheme of Landahl and Kaplan[23]. This innovation has been successfully applied for values of Reynolds numbers, $R_{\delta*}$ up to 10^5.

The velocity profiles analyzed are obtained from a direct numerical integration of the Falkner-Skan boundary-layer equation:

$$F'''(\eta) = -FF'' + \beta(F'^2 - 1) \ , \tag{11b}$$

with the appropriate value of β and the boundary conditions:

$$F(0) = F'(0) = \lim_{\eta\to\infty} (F' - 1) = 0 \ . \tag{11c}$$

The normalized velocity and its second derivative, which appear in the OS equation, are related to the function F as follows:

$$U(y) = F'(\eta) \tag{12a}$$

and

$$U''(y) = (\eta_\delta)^2 F'''(\eta) \ , \tag{12b}$$

noting that

$$\eta = \eta_\delta y \ , \tag{12c}$$

where η_δ is taken to correspond to the point at which the normalized velocity has the value 0.9990. The velocity profiles thus obtained are analyzed through the Orr-Sommerfeld equation.

For easy reference, certain profile characteristics such as the momentum thickness θ, shape factor H, boundary-layer thickness η_δ, a displacement thickness Δ^* and the minimum critical Reynolds number, $(R_{\delta_*})_c$ are given in Table III. The characteristic length used in normalizing the stability parameters is $\delta^* = \Delta^* \sqrt{[(2-\beta)\nu x/U_e]}$, see Table III.

The results of the study are presented in the form of curves of constant $\alpha_i\delta^*/R_{\delta_*}$ on the diagrams of dimensionless frequency versus Reynolds number (ω_r, R_{δ_*}) in Figures 10a-10n. The critical Reynolds numbers $(R_{\delta_*})_c$ determined by cross-plotting the computed data are presented as a function of the Hartree values of β in Table III and are shown in Figure 11. The maximum frequency ω_{max} for which disturbances are unstable, as well as the maximum spatial amplification rate $(-\alpha_i\delta^*/R_{\delta_*})_{max}$ is shown in Figure 12.

For a given value of ω, α_r and α_i, the corresponding values of c_i and c_r are determined from Equation (11a) and are presented on the diagram of dimensionless wave number versus Reynolds number $(\alpha_r\delta^*, R_{\delta_*})$ (Figs.13a-13n). The neutral curves are summarized in Figure 14. The maximum temporal amplification rate, $(c_i)_{max}$, is presented against the Hartree β in Figure 15.

In the case of negative Hartree β's, it has been theoretically established that at large Reynolds numbers the upper branch of the neutral curve does not approach the R_{δ_*}-axis, as it does with positive values of β, but approaches a certain asymptote, $\alpha_r\delta_* =$ constant. This result was discussed by Tollmien[78], who showed that the constant is a function of β. The asymptotes for $\alpha_r\delta^*$ for these cases provide a check on the validity of the present results, because the limiting inviscid solution must emerge as the exact solution of the complete Orr-Sommerfeld equation as $R \to \infty$ for non-zero values of the wave number. In this region the asymptotic method used by Pretsch[22] should be valid. The comparison in Figure 16 for $\beta = -0.10$ shows good agreement with the asymptotic value obtained by Pretsch. It may be noted from Figure 13k, $\beta = -0.05$, that the upper branch asymptote had not been achieved even at $R_{\delta_*} = 10^5$. For this reason, the calculations were extended to a Reynolds number of 200,000 for this case. Similar calculations were made for the cases $\beta = -0.01$ and $\beta = -0.025$. In none of those cases was an asymptote firmly established, although the gradient present was found to be small. The values for $R_{\delta_*} = 2 \times 10^5$ are plotted in the figure. Additional features of interest and further comparisons are found in the original reference[25].

5. SAMPLE APPLICATION OF PORTFOLIO INFORMATION TO THE HISTORY OF GROWING WAVE PACKETS IN OSCILLATING BOUNDARY LAYERS

In Section 2.1 it was observed that, except for the rectilinear Couette and Poiseuille flows, the stability theory relies on the quasi-parallel hypothesis or more generally on the hypotheses of local constant base. The limits of applicability of these hypotheses may well be delineated experimentally before a convincing theoretical treatment of x- and t-dependent shear layers will be found. In this section we recapitulate the local-constant-base formulation and illustrate the usage of the Portfolio information in the complex case of a flat-plate boundary layer growing in x and oscillating periodically with t. The reader can readily apply the procedure to steady similar and non-similar profiles for which the absence of the time variable brings about great simplification (see also Reference 23). However, there are no published stability experiments, other than those on the Blasius layer, with which the steady quasi-parallel formulation could be compared. The unsteady experiments of Obremski and Fejer[72], on the other hand, present a number of conceptual challenges for any theory.

The idealized model combines the concepts of: (a) disturbance patches ("wounds") progressing downstream with the group velocity and developing into Tollmien-Schlichting wave packets as described by Kovasznay[71] and illustrated in Figure 4 of Brooke Benjamin[36], and (b) generalization of the local approximation of the effects of steady streamwise pressure gradients to the case of unsteady pressure gradients. For mechanically generated periodic variations in mean speed, U_0, the dangerous disturbances may well amplify fast enough to reflect primarily the characteristics of the instantaneous vorticity distribution through the boundary layer. As the packet moves downstream, it would respond to the local instantaneous amplification or quenching governed by the local vorticity distribution. By knowing the stability characteristics of the various instantaneous velocity profiles that a disturbance might encounter during its passage along the boundary layer, the integrated amplification ratio between any two points on the trajectory can be determined. A comparison of the integrated amplification ratios along a trajectory of the wave packets of different frequencies would decide which disturbance wins the "prize" – its rapid reorganization into turbulence, governed by historically elusive criteria (see Section 2.5).

In Appendix A the construction of the instantaneous O-family velocity profiles is described. The specification of the amplitude parameter N_A the frequency parameter X_ω and the phase, Ω, together with the unsteady solutions $\Delta U_\star/\Delta U_{0\star}$ (Fig.21) and ϕ (Fig.22) allow the instantaneous profile:

$$U(y) = \frac{1}{1 + N_A \sin \Omega}\left\{U_{\text{Blasius}} + N_A \frac{\Delta U_\star}{\Delta U_{0\star}} \sin (\Omega + \phi)\right\} \tag{13}$$

to be specified as a function of dimensionless y. Even at the same instant, however, the profiles are non-similar in space and therefore, for each flow specification, Reynolds numbers must be associated with the values of X_ω for which profiles have been constructed. The experiments of Obremski and Fejer (Ref.72)* indicated that the amplitude parameter, N_A, and the non-steady Reynolds number, $U_{0\star}\Delta U_{0\star}/\omega_\star\nu_\star$, were significant parameters of transition. By specifying these and using the relationship

$$R_\delta^2 = \frac{36}{N_A} R_{ns} X_\omega , \tag{14}$$

one obtains the Reynolds number appropriate to a value of X_ω. One can then construct, for specific instants, a series of stability maps for the paired values $(X_\omega; R_\delta)$.

* In that paper the ratio $N_A/(\omega_\star\nu_\star/U_{0\star}^2)$ was defined a "non-steady Reynolds number". It can be written in the form $(U_{0\star}/\omega_\star)(\Delta U_{0\star}/\nu_\star)$. When greater than a critical value, the transition Reynolds number was a function of the amplitude parameter. When less than some critical value, the transition Reynolds number did not vary with the unsteady flow parameters, i.e. it was constant.

Examples of these maps which were used for determining the spatial amplification rates for particular frequencies are shown in Figures 17 for $N_A = 0.15$ and $R_{ns} = 35{,}000$. Each figure represents the stability conditions along the plate at the instant, $\Omega = \omega_\star t_\star$, for the flow specified. The coordinates are the disturbance frequency $\beta_{r\star}\nu_\star/U_{0\star}^2$ and the spatial amplification rate, $\alpha_{\star i}\nu_\star/U_{0\star}$. As stated above, the parameters X_ω and R_δ satisfy the relationship (14).

To determine the integrated amplification ratio between two points for a particular frequency, a map for that frequency is constructed from a crossplot of Figures 17. Such a map is shown in Figure 18 for a frequency of $\beta_{r\star}\nu_\star/U_{0\star}^2 = 90 \times 10^{-6}$. The coordinates of the map are the spatial amplification rate, $\alpha_{i\star}\nu_\star/U_{0\star}$, and the square of the Reynolds number, $(R_\delta)^2 \simeq R_x$. A linear variation with x is assumed between the amplification rates read from the parametric curves of Figures 17. Conditions above the neutral axis, $\alpha_{i\star}\nu_\star/U_{0\star} = 0$, are unstable and those below, stable.

To determine the trajectory in the $\alpha_{i\star}\nu_\star/U_{0\star} - R_\delta^2$ space, one starts at the point $T(R_\delta = 4050, \Omega = 7\pi/4)$ and, using the local *group velocity* c_g (available from Tables VI) for the frequency considered, projects back in space and time to the $\Omega = 3\pi/2$ curve, i.e.:

$$(R_\delta)^2_{3\pi/2} = (R_\delta)^2_{7\pi/4}\left\{1 + c_g|_{7\pi/4}\, X_\omega^{-1}\left(\frac{3\pi}{2} - \frac{7\pi}{4}\right)\right\} \tag{15}$$

or, in general, between the curves of constant Ω,

$$R_{\delta 2}^2 = R_{\delta 1}^2 + \frac{36}{N_A} R_{ns}\, c_g \Delta\Omega \; . \tag{16}$$

An iteration may be considered if a significant difference exists between the group velocities at the end points of the trajectory segment. In this way the local amplification contour is constructed back to the point I where it crosses the neutral axis. Should the disturbance remain stable upstream of this point, I is considered the initial point of the disturbance trajectory. The area between this contour and the neutral axis is proportional to the natural log of the amplification ratio between T and I, i.e.:

$$\log_e\left(\frac{A_T}{A_I}\right) = -\frac{1}{36}\int_{R_{\delta I}^2}^{R_{\delta T}^2} \frac{\alpha_{i\star}\nu_\star}{U_{0\star}}\, dR_\delta^2 \; . \tag{17}$$

For the example shown in Figure 18,

$$\log_e\left(\frac{A_T}{A_I}\right) = 5.94 \; .$$

By repeating the procedure for neighboring frequencies in the band of interest, the dominant disturbance frequency present at the terminal position can be determined. In general each disturbance frequency will begin amplifying at different place and time, experience a different amplification history and hence undergo a different amplification ratio. A similar series of calculations made at adjacent instants of time at the same R_δ will permit the construction of a wave packet, having both an amplitude and frequency variation during the phase interval considered.

The results of such calculations for two Reynolds numbers and several instants are listed in Table IV with the frequencies observed experimentally[72] at those instants and locations. Disturbances were first detected at the lower Reynolds number and transition began at the higher value.

Figure 19 is a schematic of the development of the disturbance packet based on the data of Table IV.

At a particular Reynolds number, the variation with Ω of the dominant frequency is slight while the amplification differs by a factor of 3. Hence, a construction shows a wave packet of limited duration composed of a relatively monochromatic disturbance frequency with a considerable variation in amplitude. At the lower Reynolds number the amplification ratio was greatest for $\Omega = 3\pi/2$, hence the wave packet appears centered in the trough of the trace. At the downstream Reynolds number, the amplification ratio of the dominant frequency has increased by a factor of 10 and the greatest amplification occurs at $7\pi/4$. (The amplification ratio at $\Omega = 0$ is considerably smaller.) Thus the wave packet, initially detected in the trough at $R_\delta = 3200$, *appears* to move along the waveform and amplify while decreasing in frequency. It should be understood that one is not observing the same wave packet, but rather a succession of disturbance frequencies which rise to prominence at succeeding instants and locations.

This description of wave packet development is consistent with experimental observations[72] and, together with the agreement between the observed and calculated dominant disturbance frequencies, reinforces the plausibility of the quasi-steady model as being appropriate to the study of the stability of at least some types of time-dependent boundary layers. Further examples of the consistency between experiment[72] and the application of this quasi-steady stability analysis are to be found in a recent note[10].

In the example cited, the dominant disturbance frequency, after experiencing the destabilizing portion of only one oscillation cycle, arrived at T with an intensity sufficient to make breakdown likely. Under certain conditions, however, the most amplified disturbance appears unable to achieve sufficiently high intensity during the unstable portion of a single oscillation cycle. It would then continue downstream, and suffer an attenuation during the stabilizing portion before experiencing further growth by a second destabilizing phase. Such a sequence is shown in Figure 20 for a frequency $\beta_{r\star}\nu_\star/U_{0\star}^2 = 50 \times 10^{-6}$, and flow conditions $N_A = 0.075$, $R_{ns} = 21,600$. At the end of the first growth phase the amplification ratio is $e^{1.8}$, an attenuation then occurs and at the end of the second growth phase, the total amplification ratio is $e^{6.8}$. The frequency shown is consistent with the experimental observation of the dominant frequency at this position and time, although transition occurred farther downstream. For flow conditions where $R_{ns} < 25,000$, Reference 72 showed that the transition was surprisingly delayed and that the transition Reynolds number became independent of the oscillation parameters. The local-constant-base formulation of the stability theory suggests that the inability of the most amplified disturbance to achieve sufficient intensity after a single destabilizing phase may be the key effect associated with this delayed transition phenomenon.

The examples outlined above illustrate the most general usage of the Portfolio information. In the treatment of non-similar steady flows, e.g. flow over a wavy wall, the main problem is the selection of matching profiles, in x only, for a good estimate of stability characteristics. Once accomplished, the tracing procedure is considerably less involved because the parameter Ω vanishes, and with it the necessity of considering the propagation velocity, c_g. For steady, *similar* flows the problem is reduced to matching the user's single profile to one of those contained in the Portfolio. The subsequent amplification calculation is then easily accomplished as only the stability characteristics for a single profile are required.

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APPENDIX A

DETAILED INFORMATION ON THE O FAMILY OF VELOCITY PROFILES

The profiles were constructed from solutions of an incompressible, two-dimensional, unsteady boundary layer on a flat plate where the external stream has the form

$$U_{e*} = U_{0*}(1 + N_A \sin \omega_* t_*) \quad . \tag{A1}$$

This problem is equivalent to that of a steady stream over a flat plate oscillating in its own plane[73].

The instantaneous profiles were composed of a time-dependent component superposed on a mean Blasius profile. When the oscillations have small amplitudes and low frequencies, their effect on the mean profile is $O[N_A^2]$ (Ref.73). At high frequencies, Lin[74] has shown that regardless of the amplitude, the unsteady and mean flow (Blasius) equations are decoupled and hence such a superposition should be valid.

The unsteady component was derived from the analytical solutions of Nickerson[75] and Hill[76] and the numerical solutions of Farn and Arpaci[77]. These non-similar solutions are presented in terms of an amplitude variation, $\Delta U_*/\Delta U_{0*}$, and a velocity phase shift, ϕ, across the boundary layer and are functions of the two variables: $y_*(\omega_*/2\nu_*)^{\frac{1}{2}}$ and X_ω. The first of these is the similarity variable of periodic flows and the second is proportional to the ratio of the squares of the viscous to the unsteady Rayleigh boundary-layer thickness.

If distances normal to the plate are non-dimensionalized by the nominal mean boundary-layer thickness,

$$\delta = 6.0(x_* \nu_*/U_{0*})^{\frac{1}{2}} \quad ,$$

and the velocity normalized by its value at the edge of the layer (Eq.(A1)), the solutions $\Delta U_*/\Delta U_{0*}$ and ϕ may be expressed as functions of y and X_ω (Figs.21 and 22). Finally, by assuming that the generation of higher harmonics in the boundary layer may be neglected[77], we can construct an instantaneous velocity profile of the form:

$$U(y) = \frac{1}{1 + N_A \sin \Omega}\left\{U_{Blasius} + N_A \frac{\Delta U_*}{\Delta U_{0*}} \sin (\Omega + \phi)\right\} \quad . \tag{A2}$$

The computer program[24] used for the stability analysis required the velocity profile be cast in the form:

$$U = 1 - \exp\left[-2y(y + 1)\right] + \sum_{n=1}^{m} A_n y^n \quad , \tag{A3}$$

where the values of A_n are determined by a least squares fit to the profile. The computer available for generating the A_n's was limited by its precision to a sixth degree polynomial fit which was not sufficient for all profiles and, in some, resulted in rather bizarre distributions of the second derivative. This limitation was circumvented by fitting an appropriate sixth degree polynomial expression to the second differences of the velocity profile data. The value of profile curvature at the wall was specified from the instantaneous pressure gradient

$$U''(0) = -36 N_A X_\omega \frac{\cos \Omega}{1 + N_A \sin \Omega} \tag{A4}$$

and the curvature at the edge of the boundary layer, $U''(1)$, set equal to zero. Integrating twice and applying boundary conditions,

$$U(0) = 0 \tag{A5a}$$

$$U(1) = [U(1)_{Blasius} + N_A \sin \Omega]/(1 + N_A \sin \Omega) \ , \tag{A5b}$$

results in Equation (A3) with $m = 8$. Through this approach one controls the very important second derivative and has a higher degree polynomial for describing higher frequency instantaneous velocity distributions.

Because of the non-similarity of the profiles, the data of Obremski and Fejer[72] served as a guide in selecting ranges of parameters which would yield profiles significant to the stability study. Several of the run conditions[72] of special interest had values of the amplitude parameter, N_A, close to 0.15 and 0.075, so they formed the two main categories of profiles. For $N_A = 0.15$ value, the lower frequency parameter range was of importance during the instability development. Hence profiles were analyzed at $X_\omega = 0.4$, 0.8, 1.4, and 2.5, while, for $N_A = 0.075$, the higher frequency range was of greater significance and values of $X_\omega = 0.8$, 1.4, 2.5, 5.06 and 9.0 were selected. For most values of X_ω, Ω was set to: 0.0, $\pi/2$, π, $5\pi/4$, $3\pi/2$, and $7\pi/4$. In addition, other profiles of interest were analyzed.

Several Reynolds numbers were investigated for each profile, the first priority being to satisfy the requirements of the quasi-steady stability analysis and, second, the requirements for a reasonable representation of the profiles in the Portfolio. As stated in the *Introduction*, profiles with inflection points received greater emphasis.

APPENDIX B

DETAILED INSTABILITY CHARACTERISTICS FOR THE 0 PROFILES

With a specification of N_A, X_ω, and Ω the velocity profile is described. Stability characteristics of these profiles were obtained on the MIT Compatible Time Sharing System using the computer program of Landahl[24]. This program integrates the linearized, two-dimensional disturbance equation and computes the eigenvalues appropriate to the input velocity profile, Reynolds number and real frequency or real wave number depending on whether the spatial or temporal mode of stability is desired. For this study the spatial mode was slightly more convenient and was generally used.

The temporal stability of a few profiles was analyzed and compared with the results achieved through a Gaster transformation of spatial characteristics. As mentioned in Section 2.1, the agreement was good for all cases tested. These temporal results appear under the title "Temporal Mode Solutions".

For two of the profiles, (0.075, 5.06, $\pi/2$) and (0.075, 9.0, $\pi/2$), higher mode eigenvalues were found in the spatial formulation. For one of these a temporal analysis was also done. These data appear under the titles "Higher Mode Solutions" and "Temporal Data, Higher Mode Solutions" respectively.

The profiles are arranged in Tables VI according to their unsteady flow designations (NA, XW/U, WT). Certain of their profile characteristics are listed in Table V. The profile coefficients of Equation (A3) are listed at the beginning of each profile data set. Within each profile set are sub-sets of increasing Reynolds number and in each of these sub-sets a sequence of frequencies or wave numbers appears.

The table formats differ for the spatial and temporal modes. In the spatial mode, "BETAR*DELTA/U" is the independent variable and appears in the first column, while for the temporal mode the wave number ALFAR*DELTA assumes this role. The intermediate columns list other properties of the disturbance wave, in particular the spatial (ALFAI*NU/U) or temporal (CIMAG) amplification rates and the group velocity. The spatial eigenvalues (ALFAR*DELTA and ALFAI*DELTA) were computed to tolerances of 0.005 and 0.001 respectively. Tolerances for the temporal eigenvalues (WAVE VEL. and CIMAG) were 0.001 and 0.0005 respectively. The GROUP VEL. for a disturbance frequency was calculated as the average of $[(\Delta \text{BETAR*DELTA/U})/(\Delta \text{ALFAR*DELTA})]_{R_\delta}$ for the adjacent frequencies. Using the group velocity, the Gaster transformation (Table I) yields the growth rate in the alternate mode which is listed in the last column (CITMP for the temporal and ALFAI*NU/U for the spatial mode).

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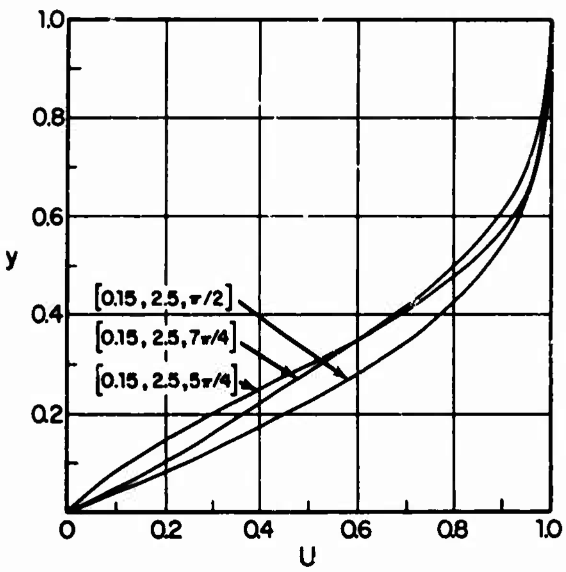

Fig. 1a Instantaneous velocity profiles during an oscillation cycle; $N_A = 0.15$, $X_\omega = 2.5$

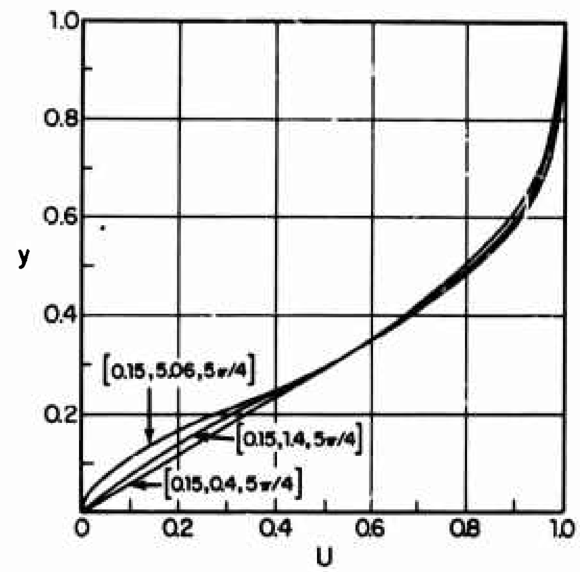

Fig. 1b Instantaneous velocity profiles along the plate at the same instant; $N_A = 0.15$, $\Omega = 5\pi/4$

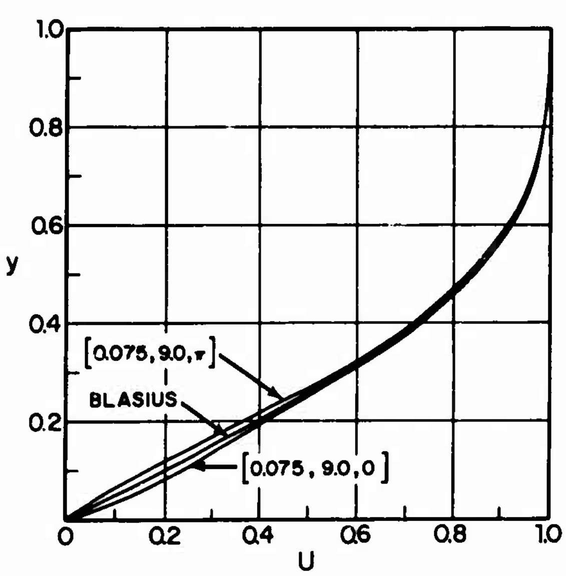

Fig. 1c A comparison of three velocity distributions

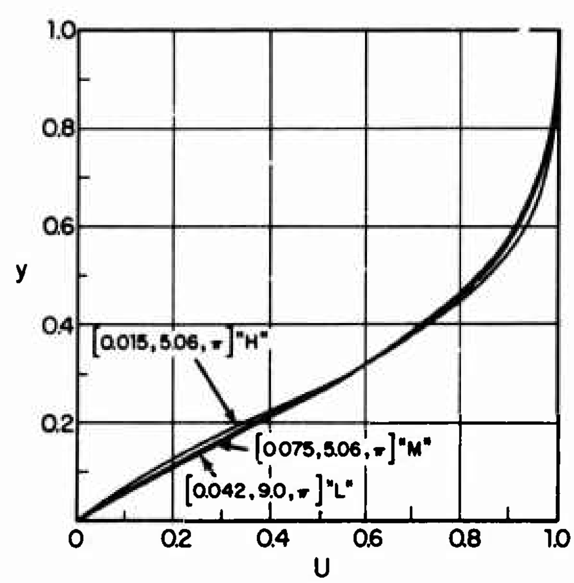

Fig. 1d Instantaneous profiles having equal curvature at the wall, $U''(0) = 13.6$

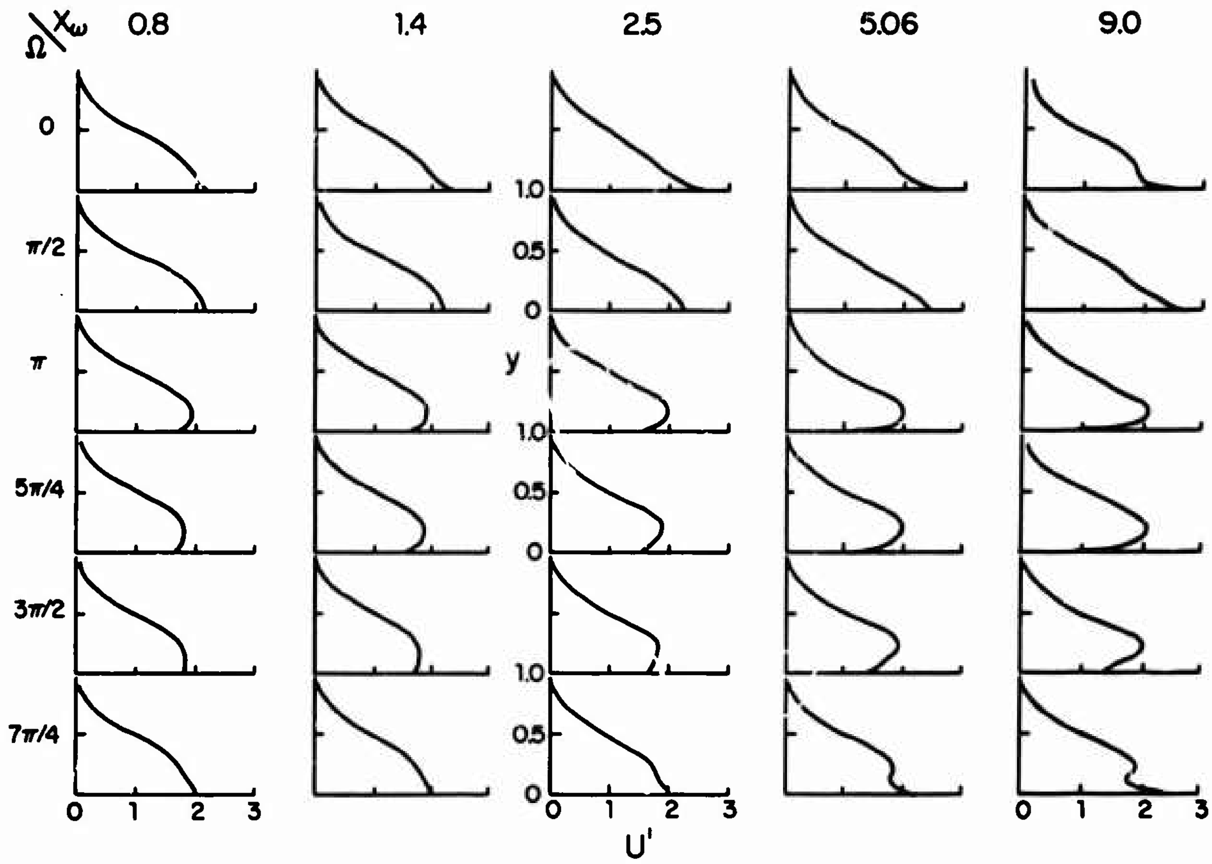

Fig. 2a Mosaic of instantaneous vorticity distributions, $N_A = 0.075$

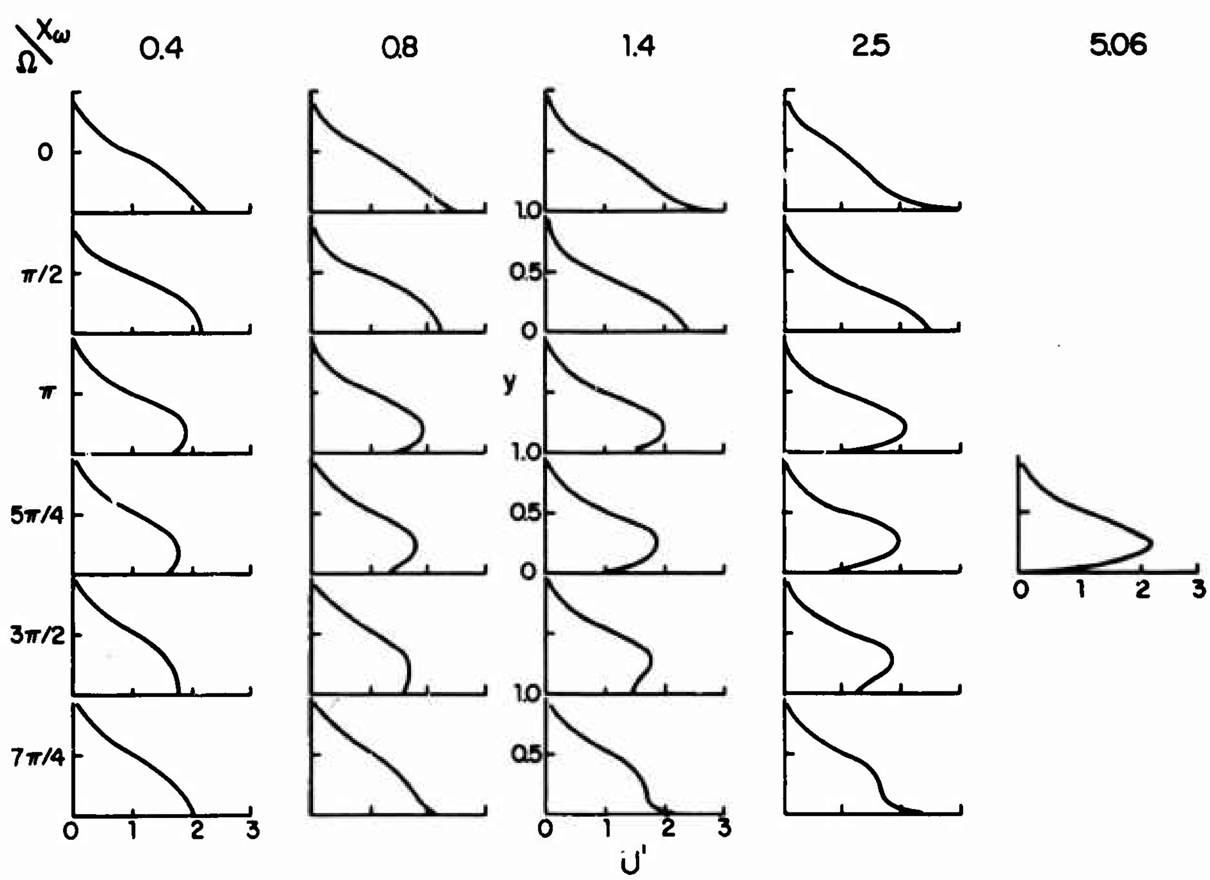

Fig. 2b Mosaic of instantaneous vorticity distributions, $N_A = 0.15$

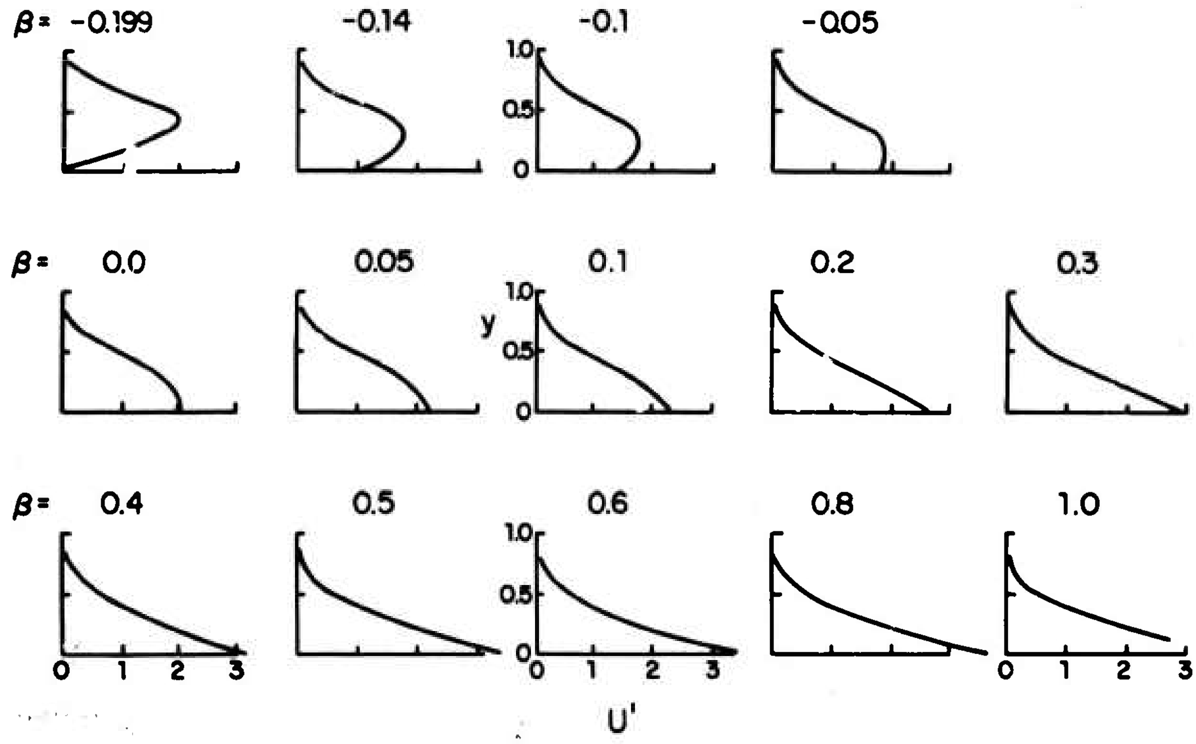

Fig. 2c Vorticity distribution; Falkner-Skan family

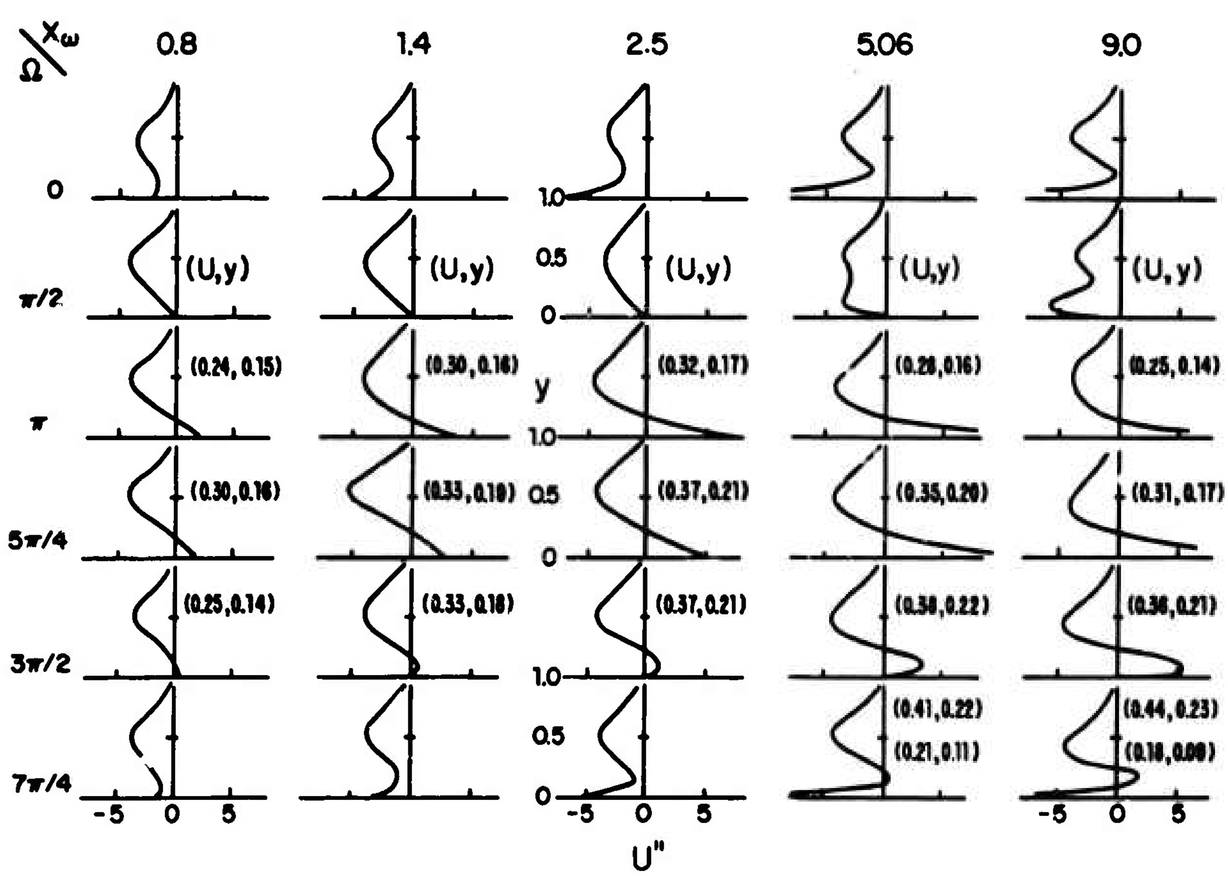

Fig. 3a Mosaic of instantaneous curvature distributions, $N_A = 0.075$

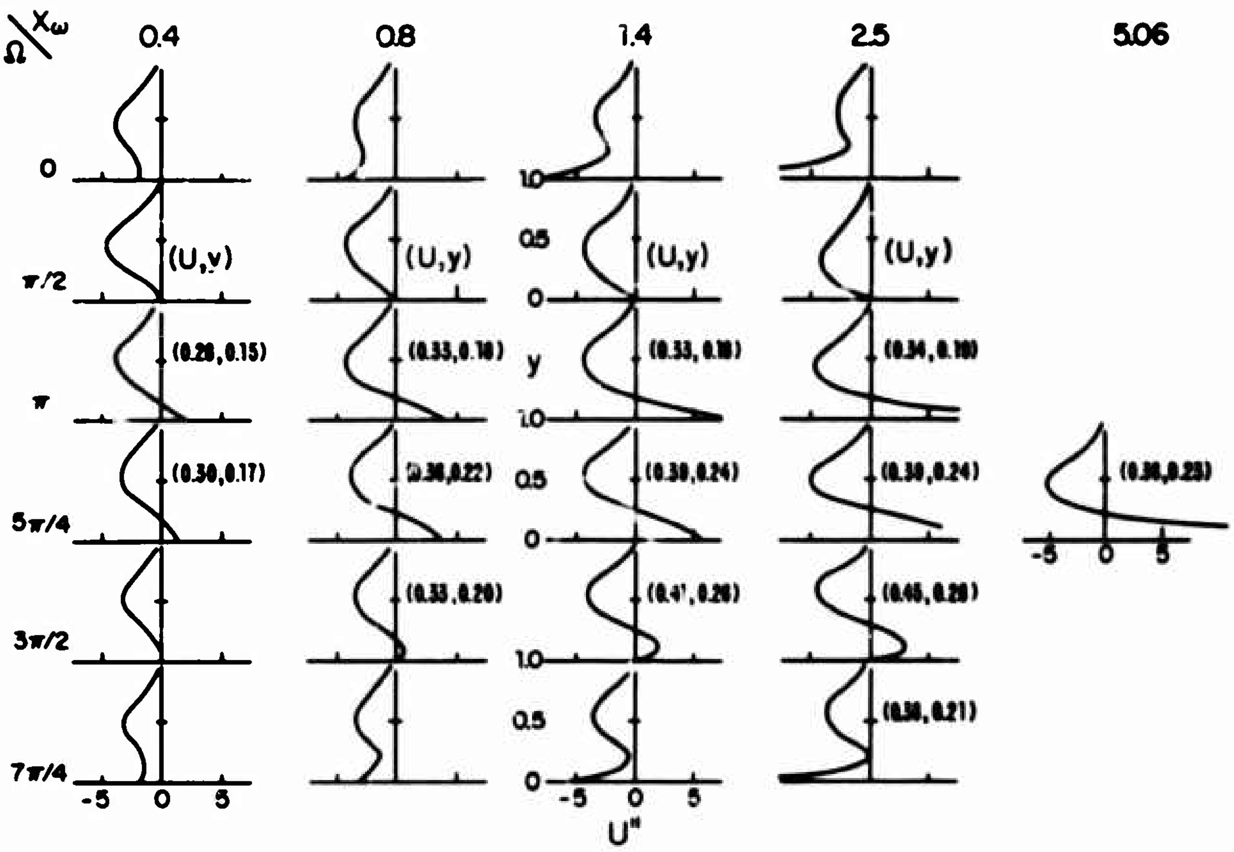

Fig. 3b Mosaic of instantaneous curvature distributions, N_A = 0.15

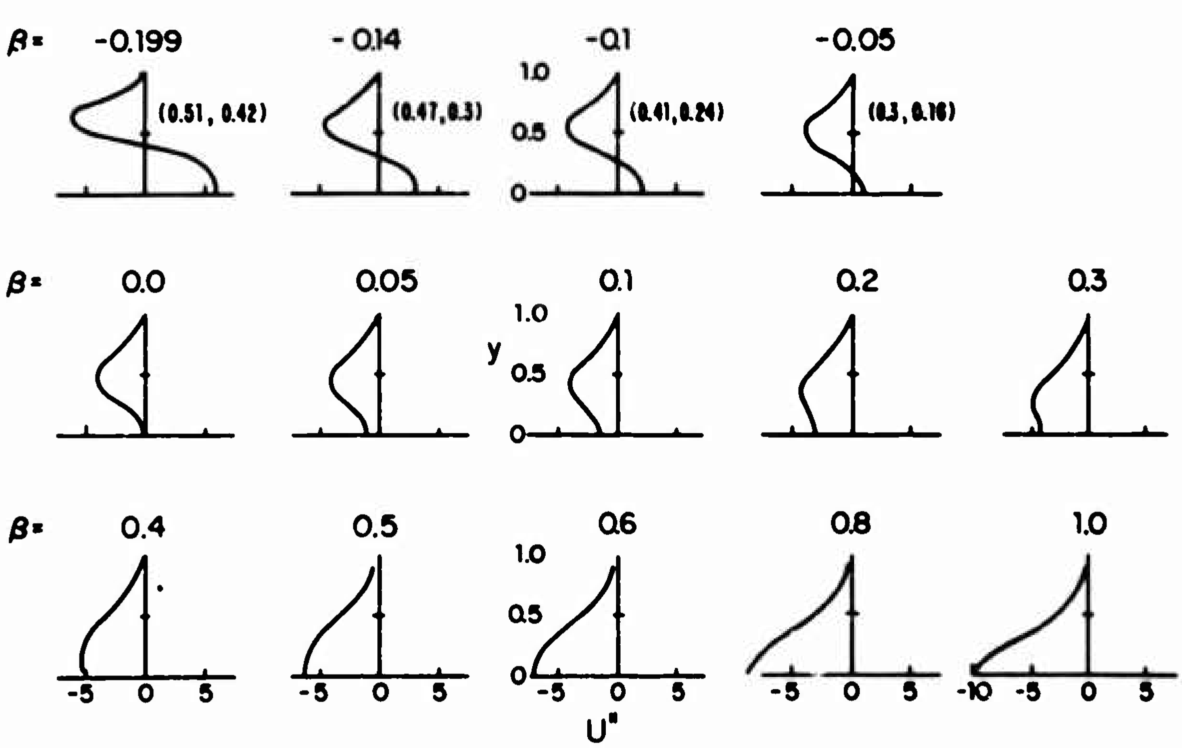

Fig. 3c Curvature distribution, Falkner-Skan family

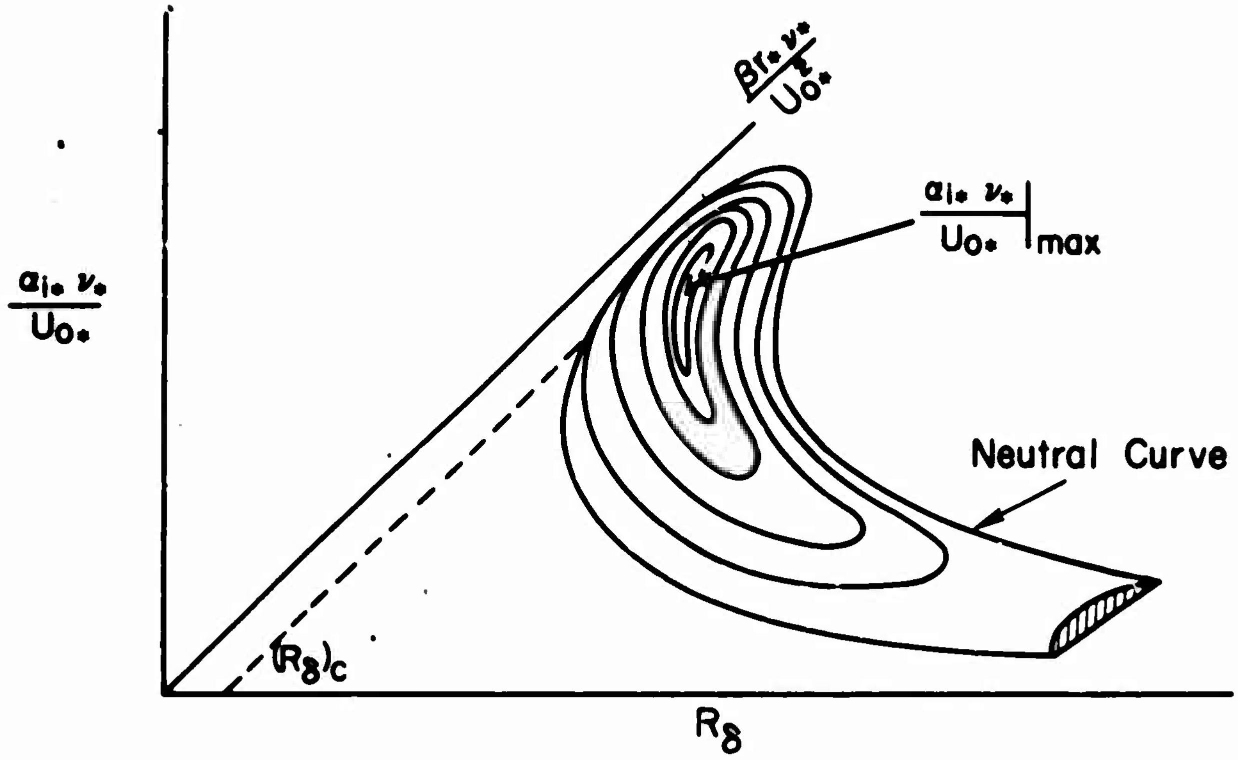

Fig.4 Three-dimensional representation of typical stability characteristics

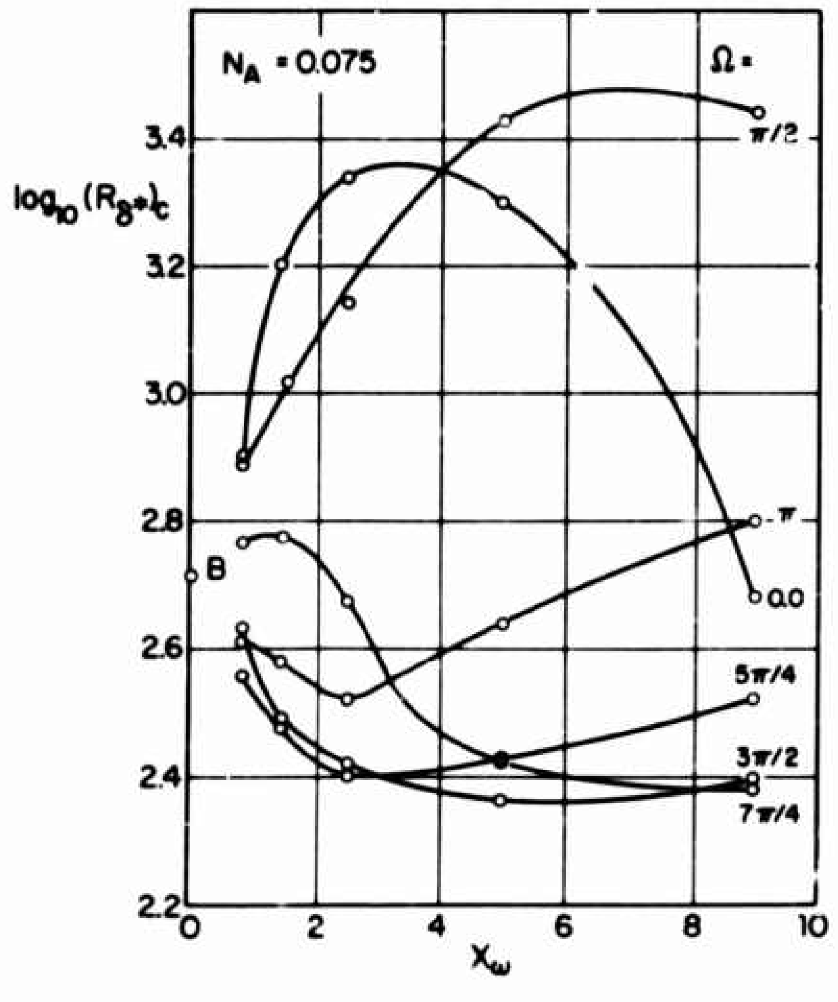

Fig.5 Critical Reynolds number as a function of frequency parameter; $N_A = 0.075$

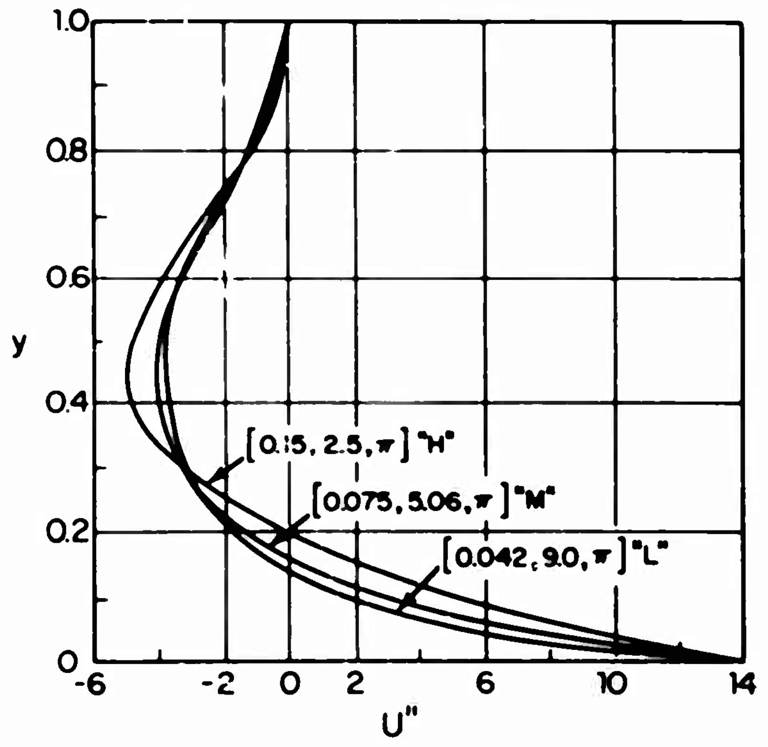

Fig.6 Curvature distribution for profiles having curvature at the wall. $U''(0) = 13.6$

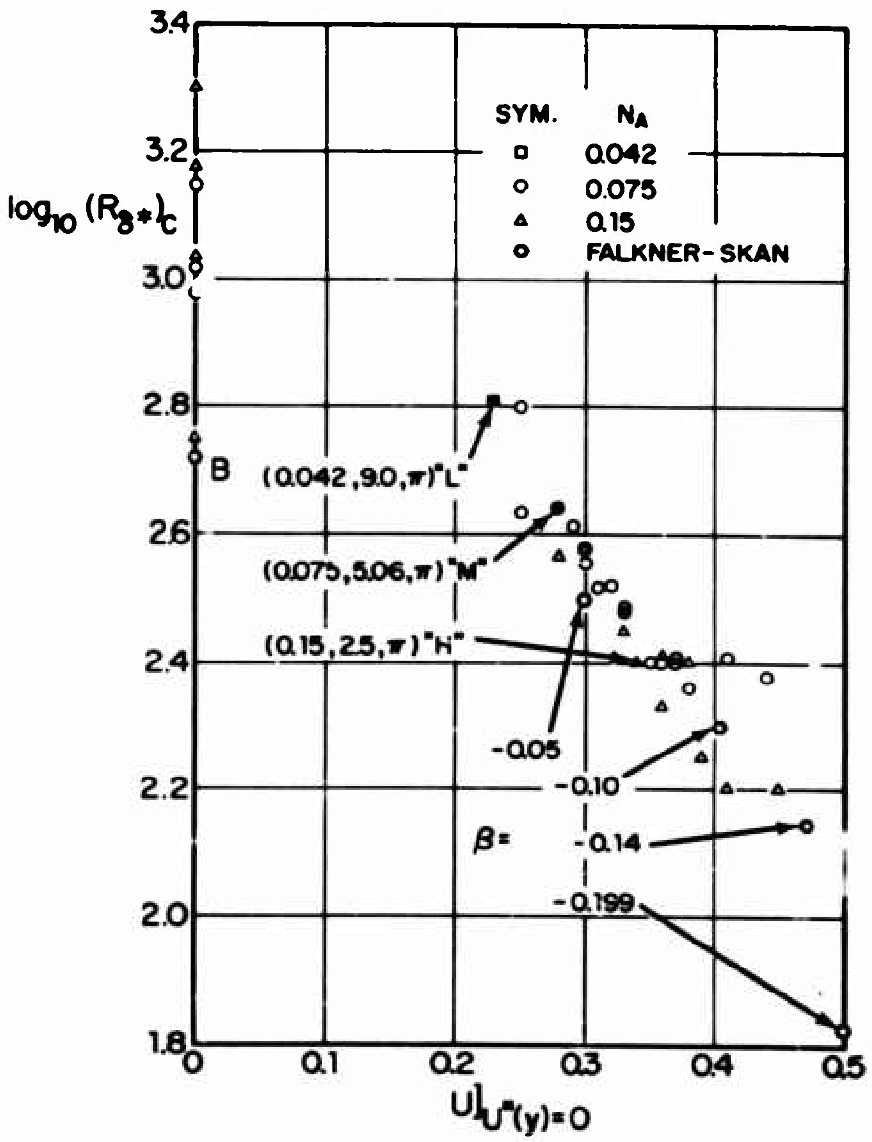

Fig.7 Critical Reynolds number as a function of velocity at the inflection point

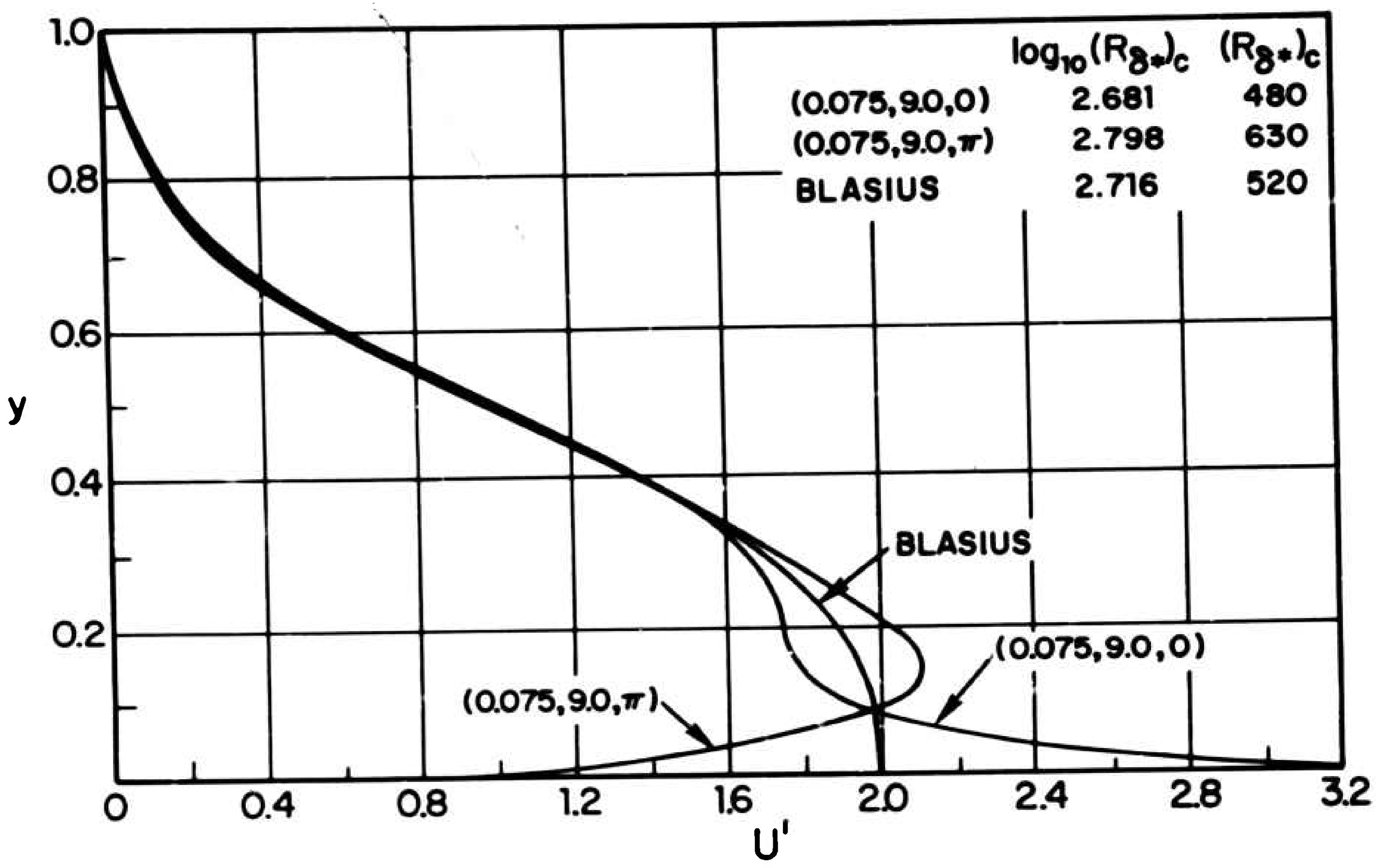

Fig. 8 A comparison of three vorticity distributions

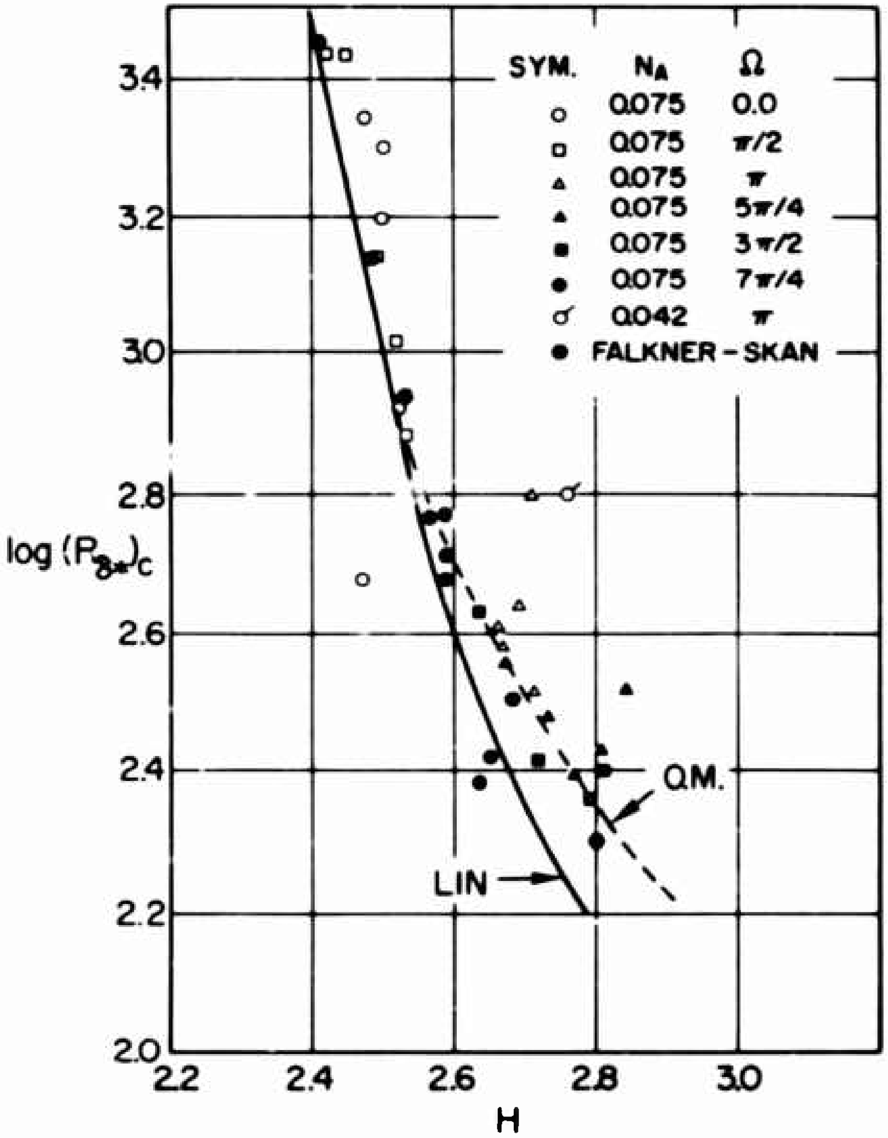

Fig. 9a Critical Reynolds number as a function of shape parameter; $N_A = 0.075$

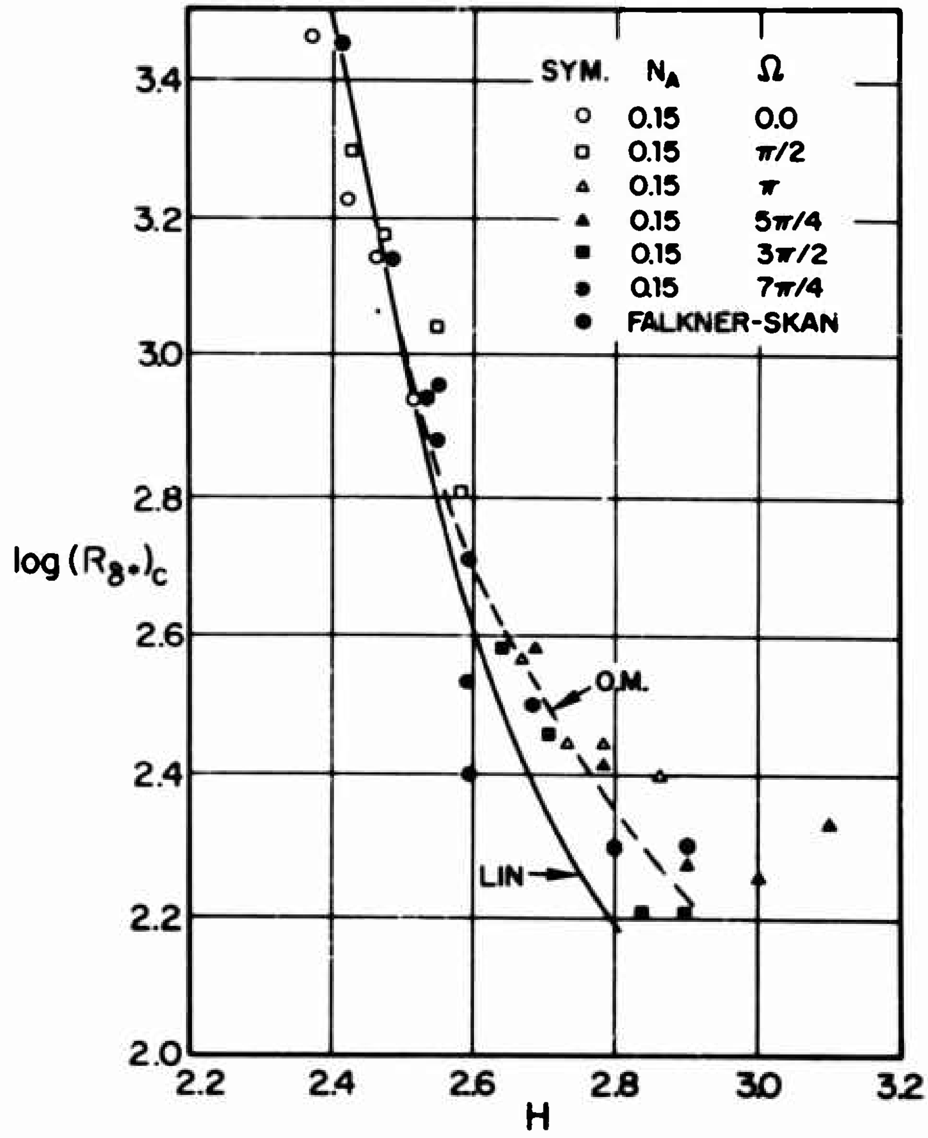

Fig. 9b Critical Reynolds number as a function of shape parameter; $N_A = 0.15$

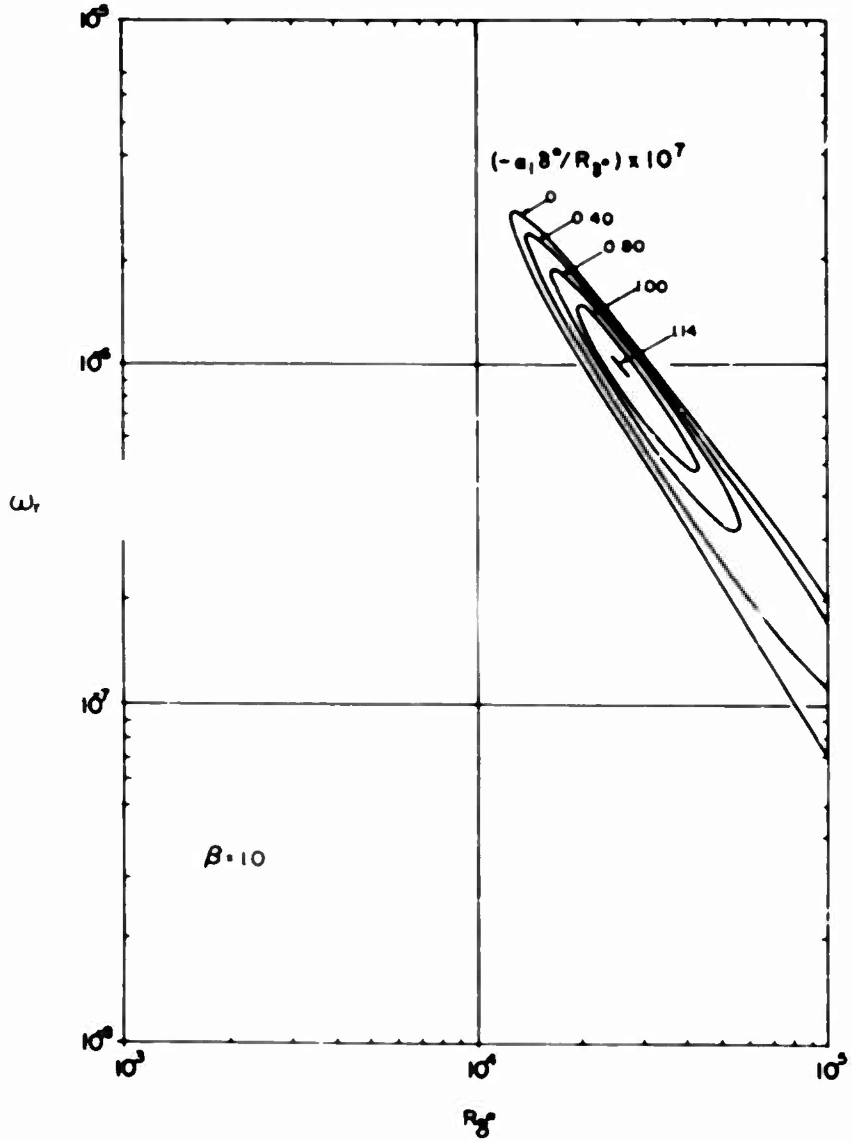

Fig. 10a Curves of constant spatial amplification rates (β = 1.0)

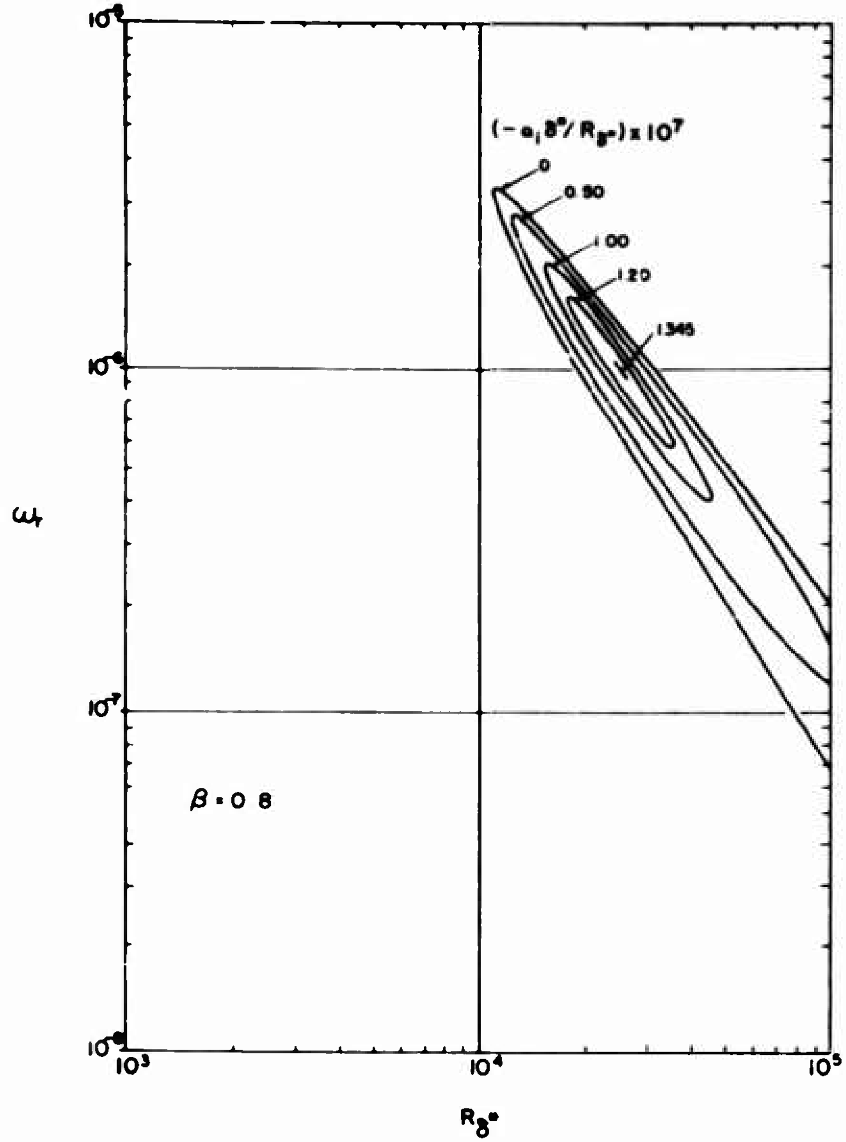

Fig. 10b Curves of constant spatial amplification rates (β = 0.8)

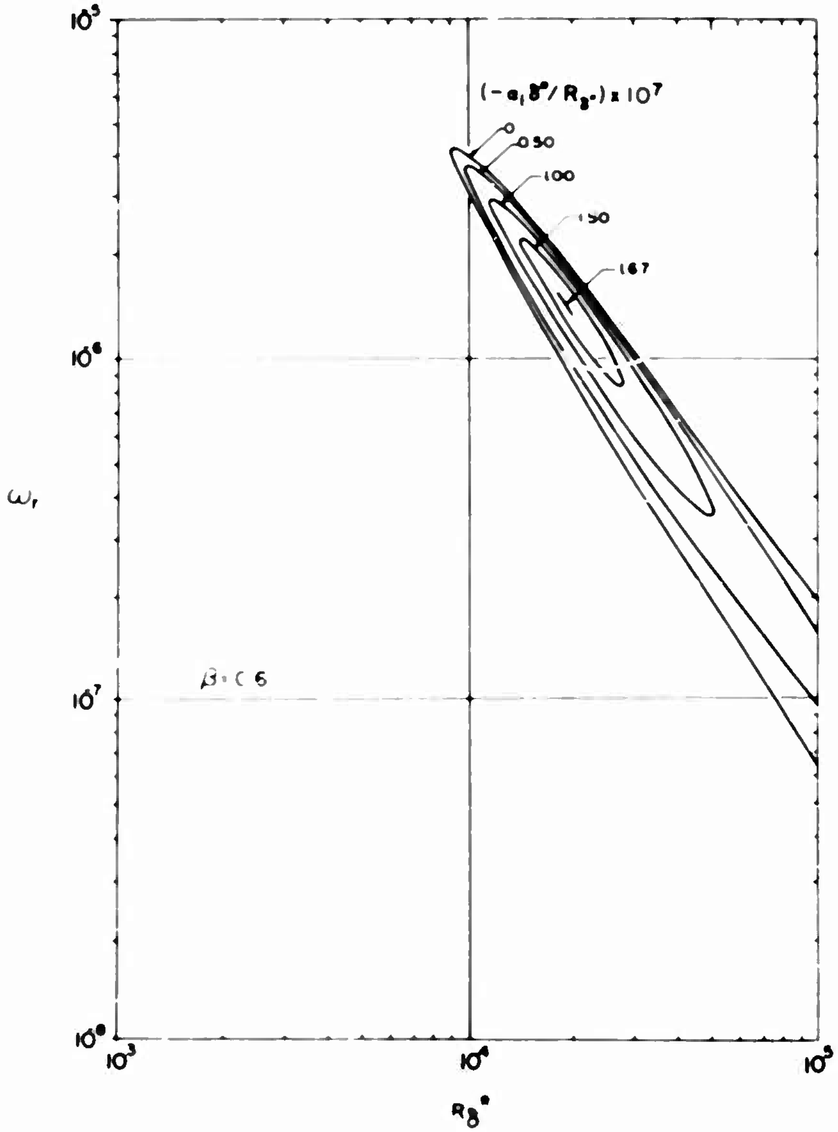

Fig. 10c Curves of constant spatial amplification rates ($\beta = 0.6$)

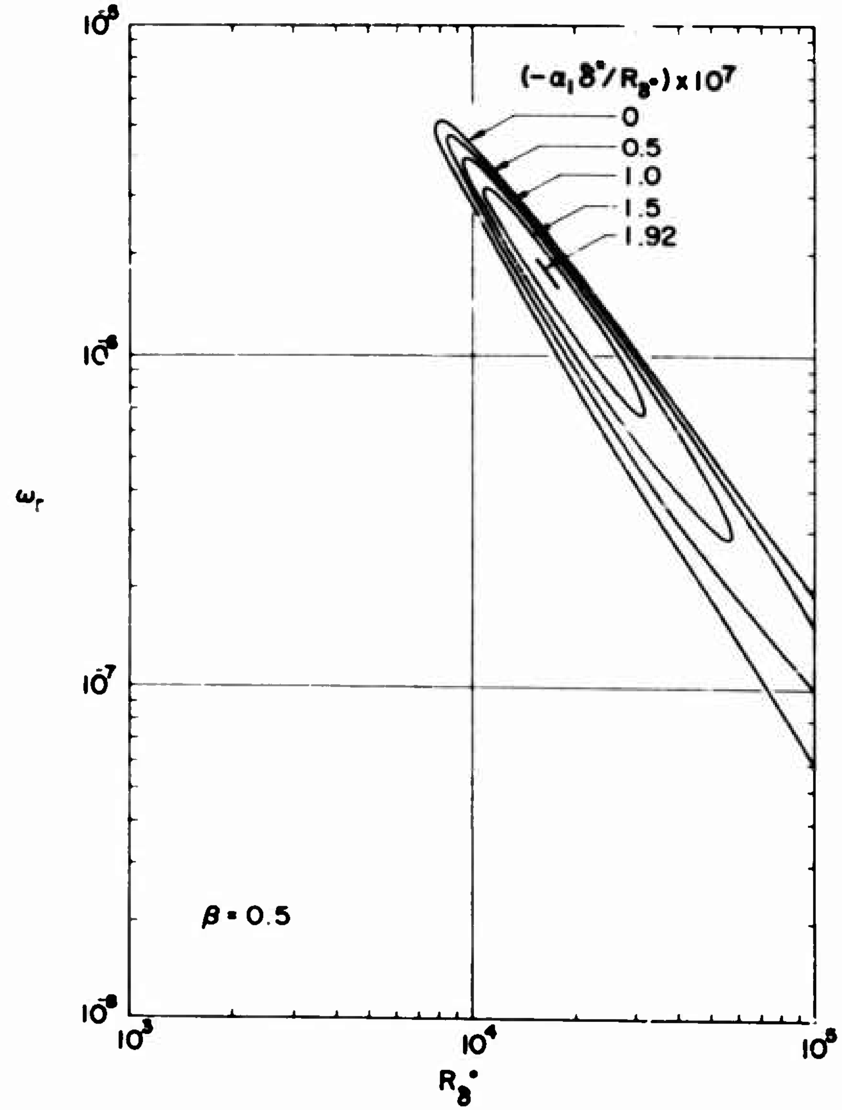

Fig. 10d Curves of constant spatial amplification rates ($\beta = 0.5$)

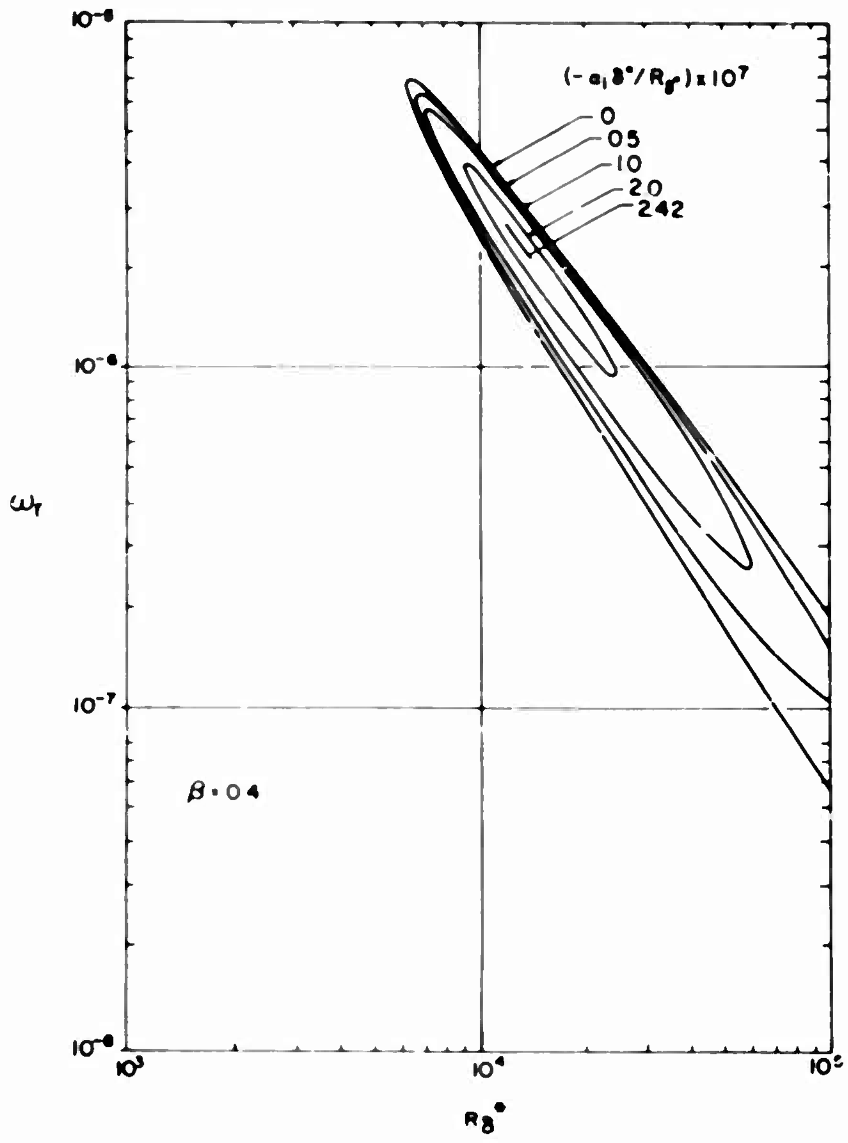

Fig. 10e Curves of constant spatial amplification rates (β = 0.4)

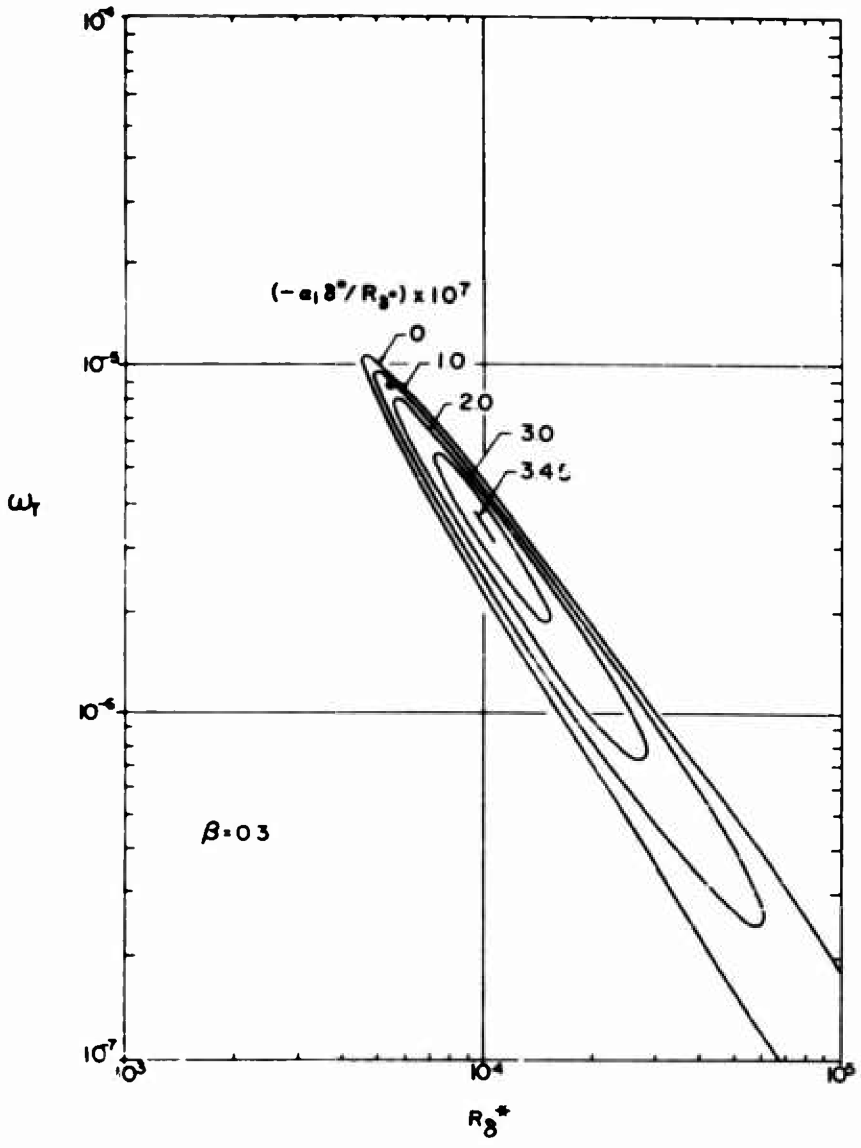

Fig. 10f Curves of constant spatial amplification rates (β = 0.3)

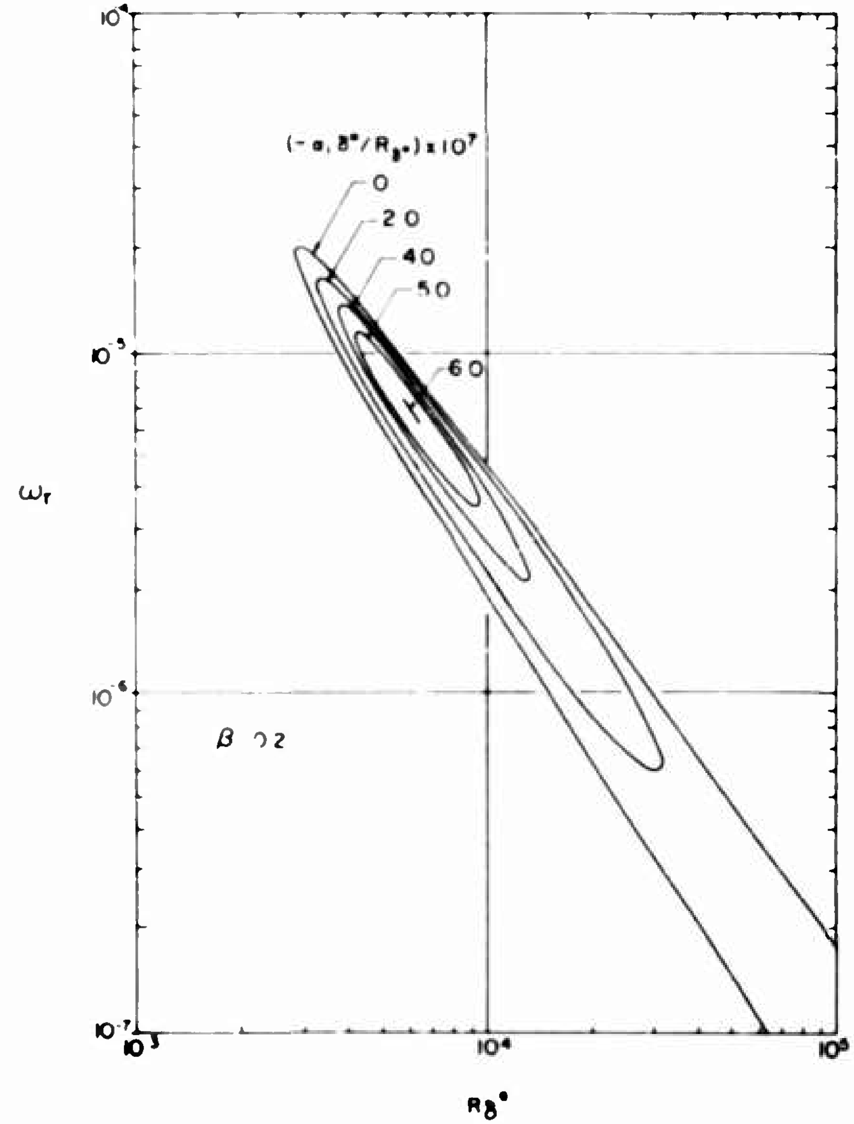

Fig. 10g Curves of constant spatial amplification rates (β = 0.2)

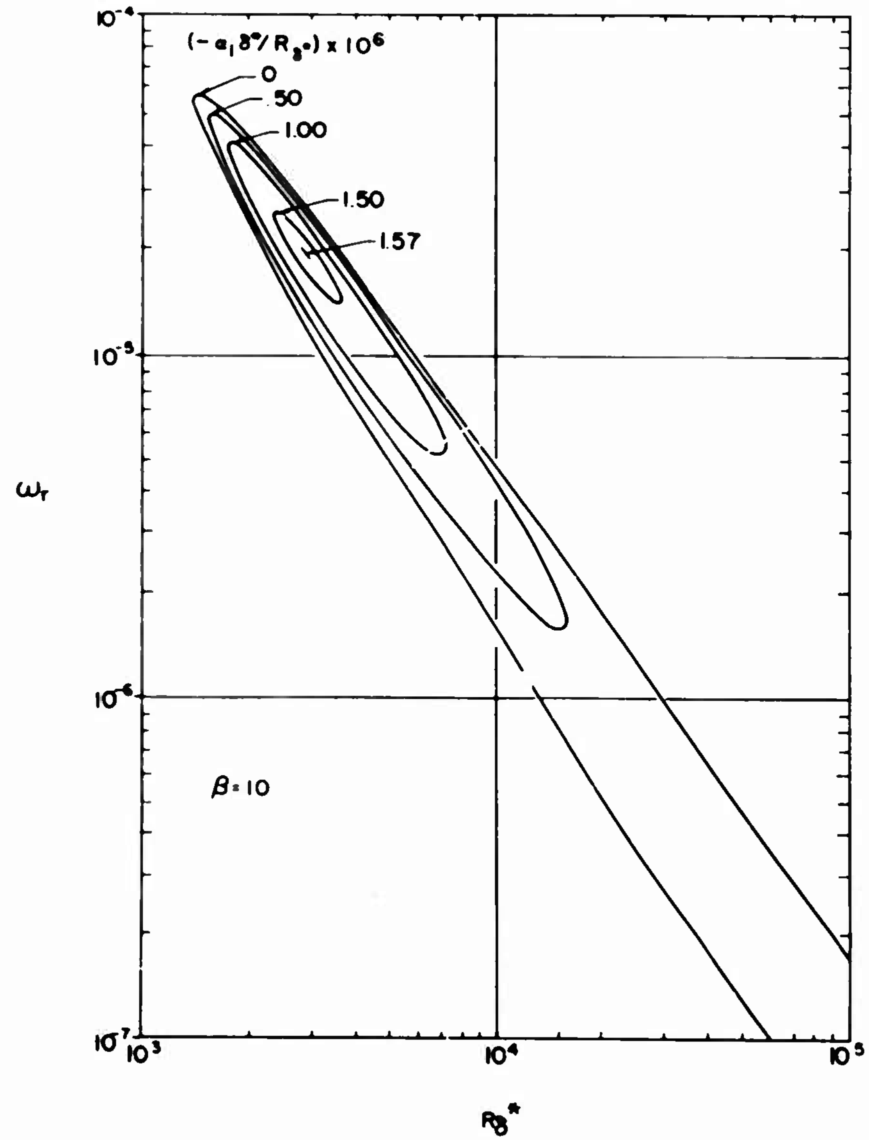

Fig. 10h Curves of constant spatial amplification rates (β = 0.1)

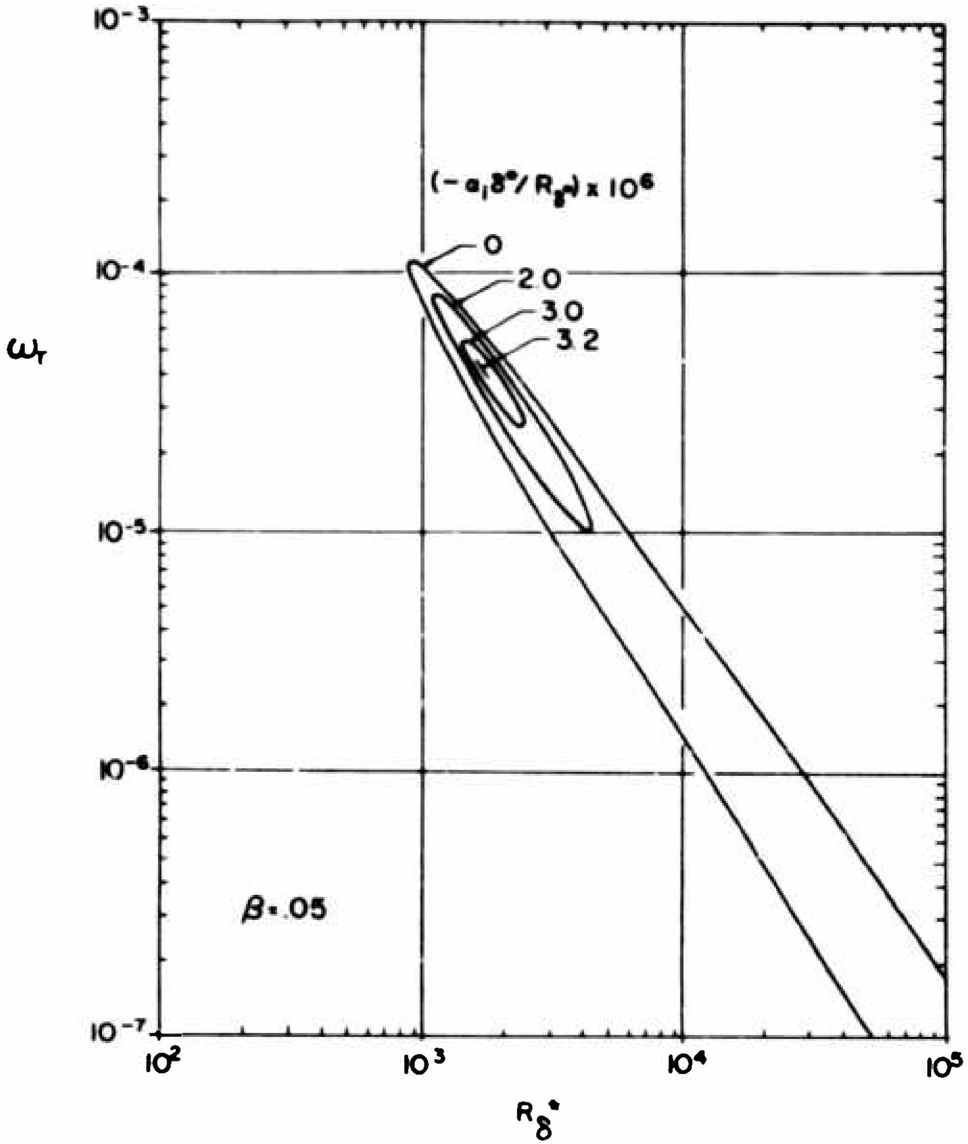

Fig. 10i Curves of constant spatial amplification rates (β = 0.05)

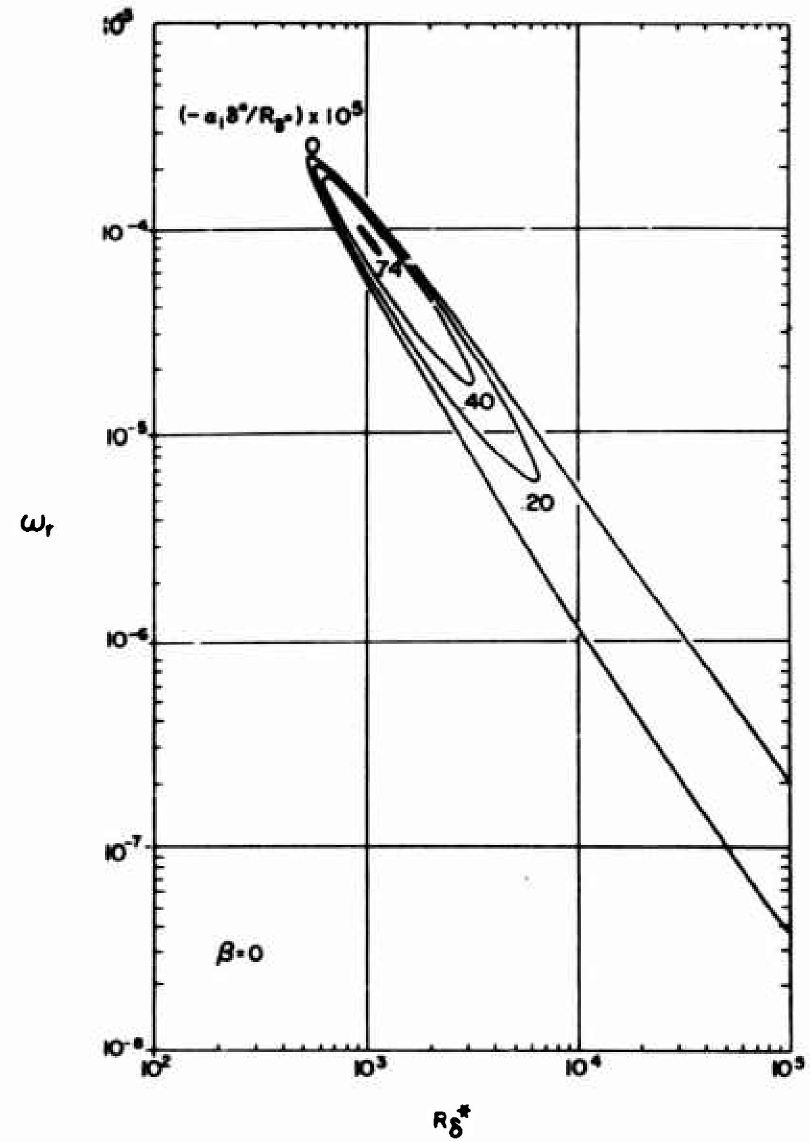

Fig. 10j Curves of constant spatial amplification rates (β = 0)

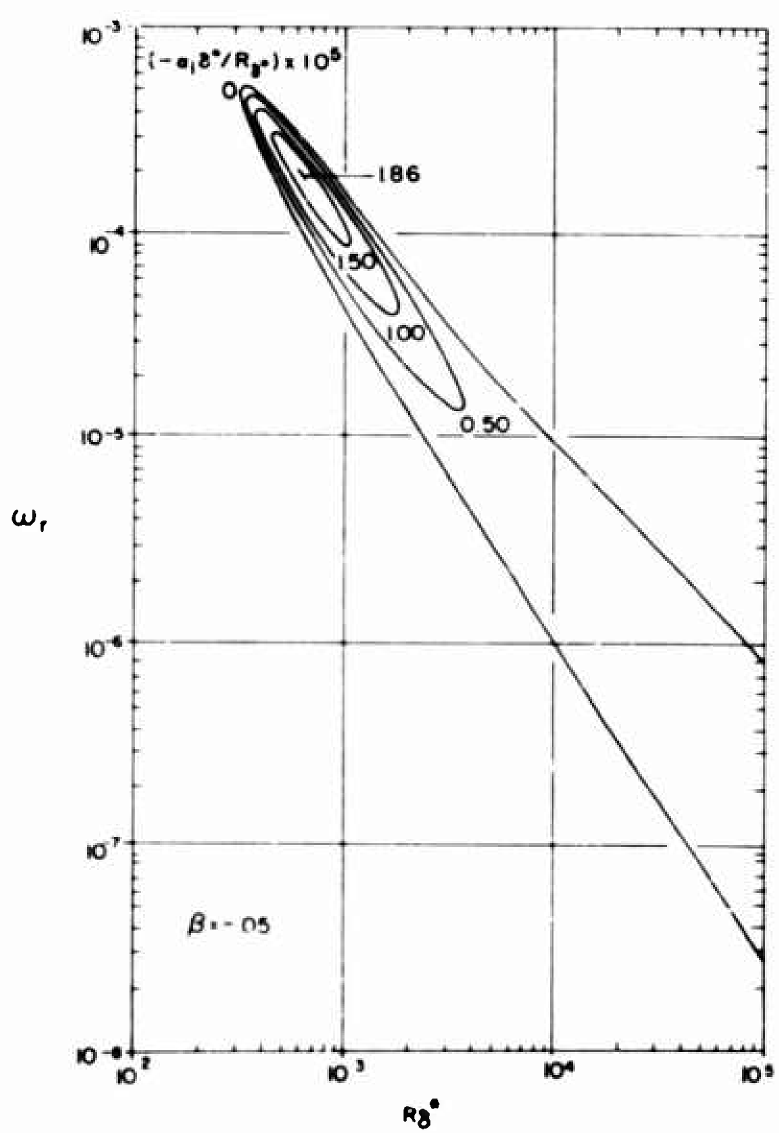

Fig. 10k Curves of constant spatial amplification rates ($\beta = -0.05$)

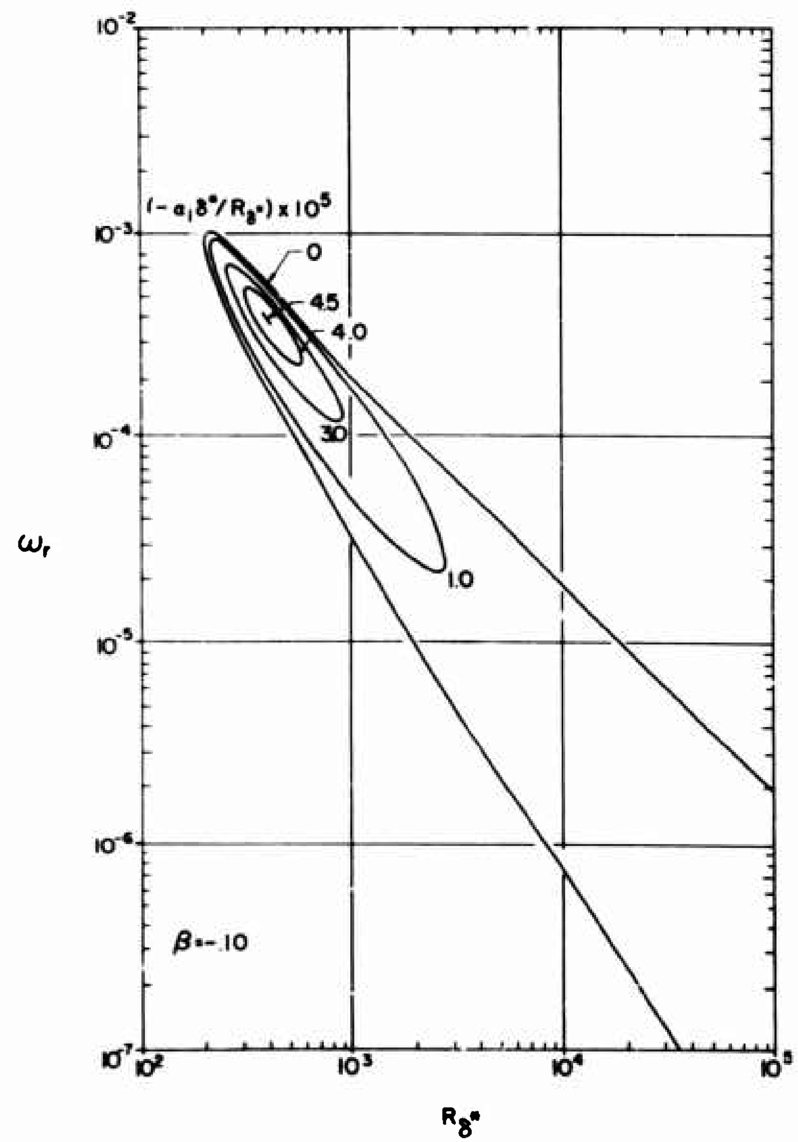

Fig. 101 Curves of constant spatial amplification rates ($\beta = -0.10$)

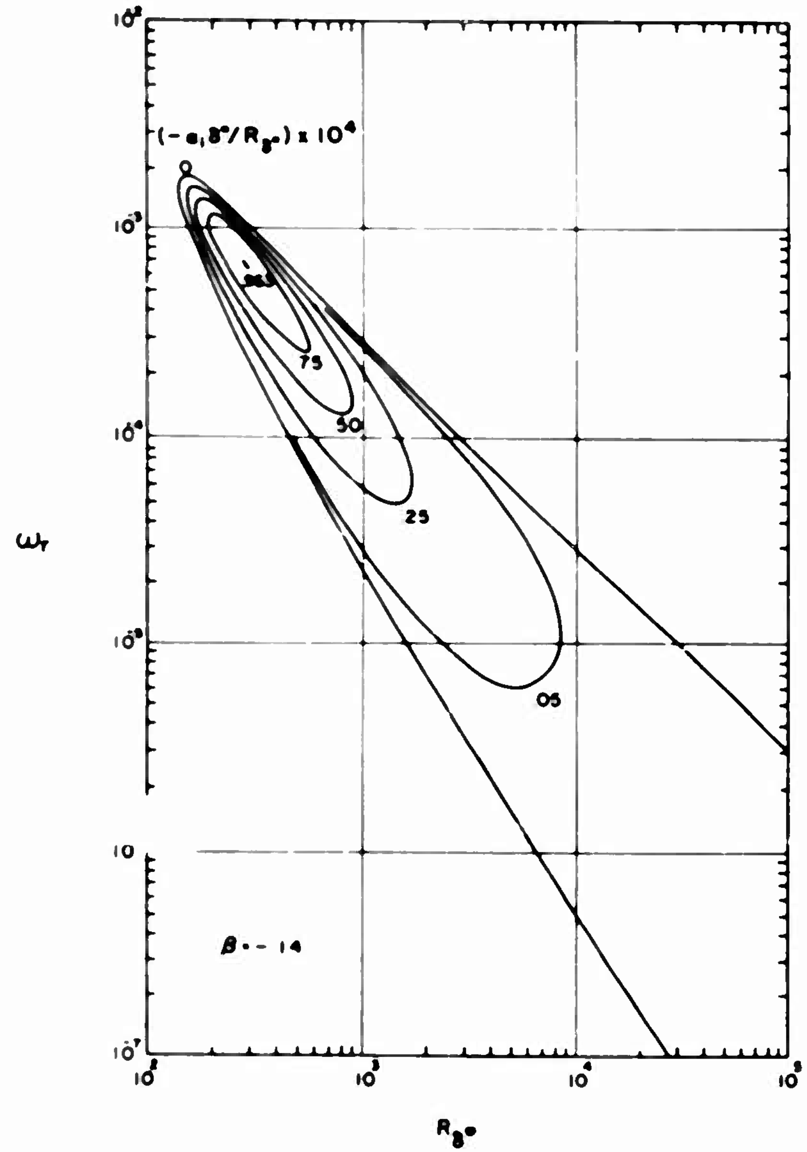

Fig. 10m Curves of constant spatial amplification rates ($\beta = -0.14$)

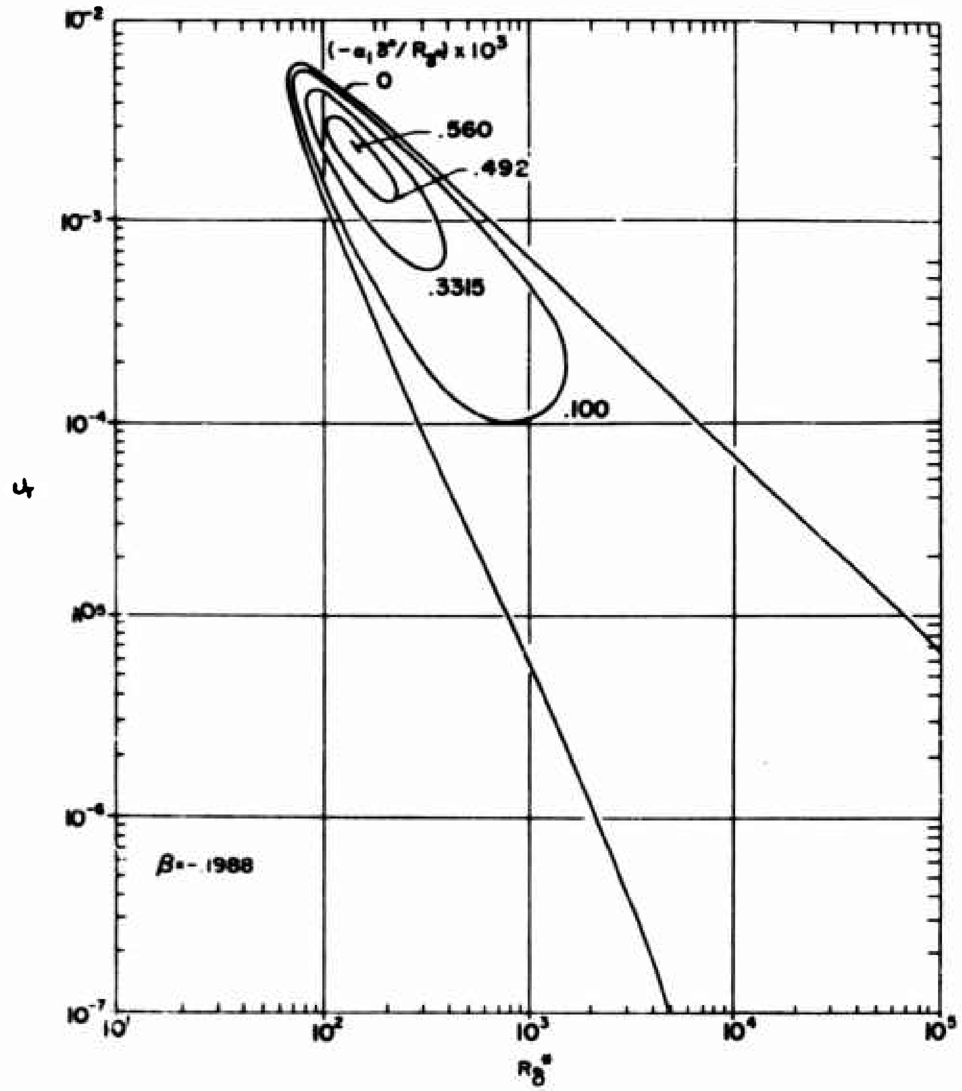

Fig. 10n Curves of constant spatial amplification rates ($\beta = -0.1988$)

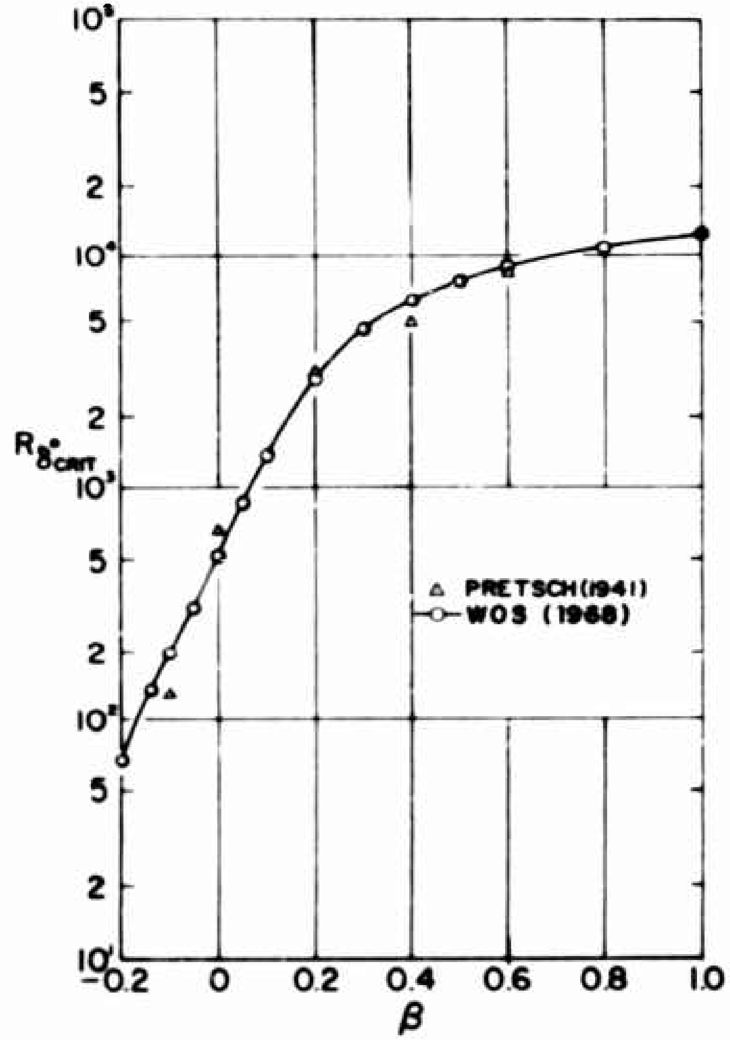

Fig. 11 Effect of pressure gradient on the critical Reynolds number

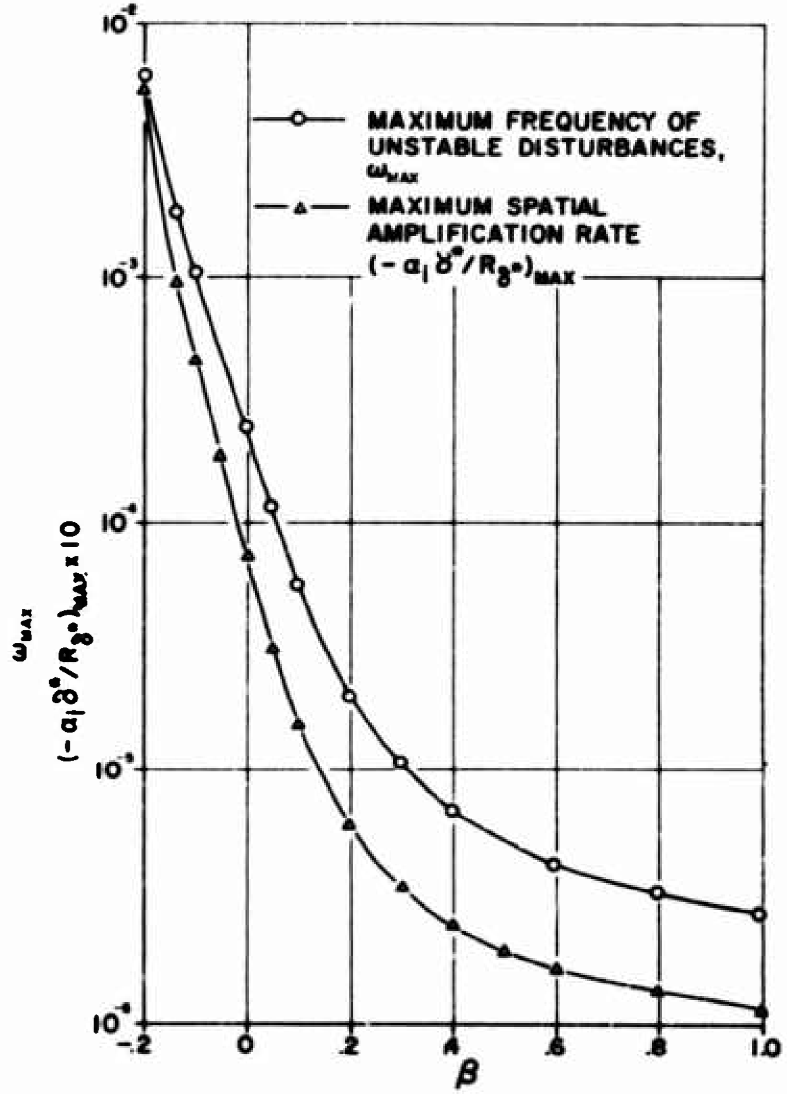

Fig. 12 Effect of pressure gradient on the maximum spatial amplification rate and frequency of unstable disturbances

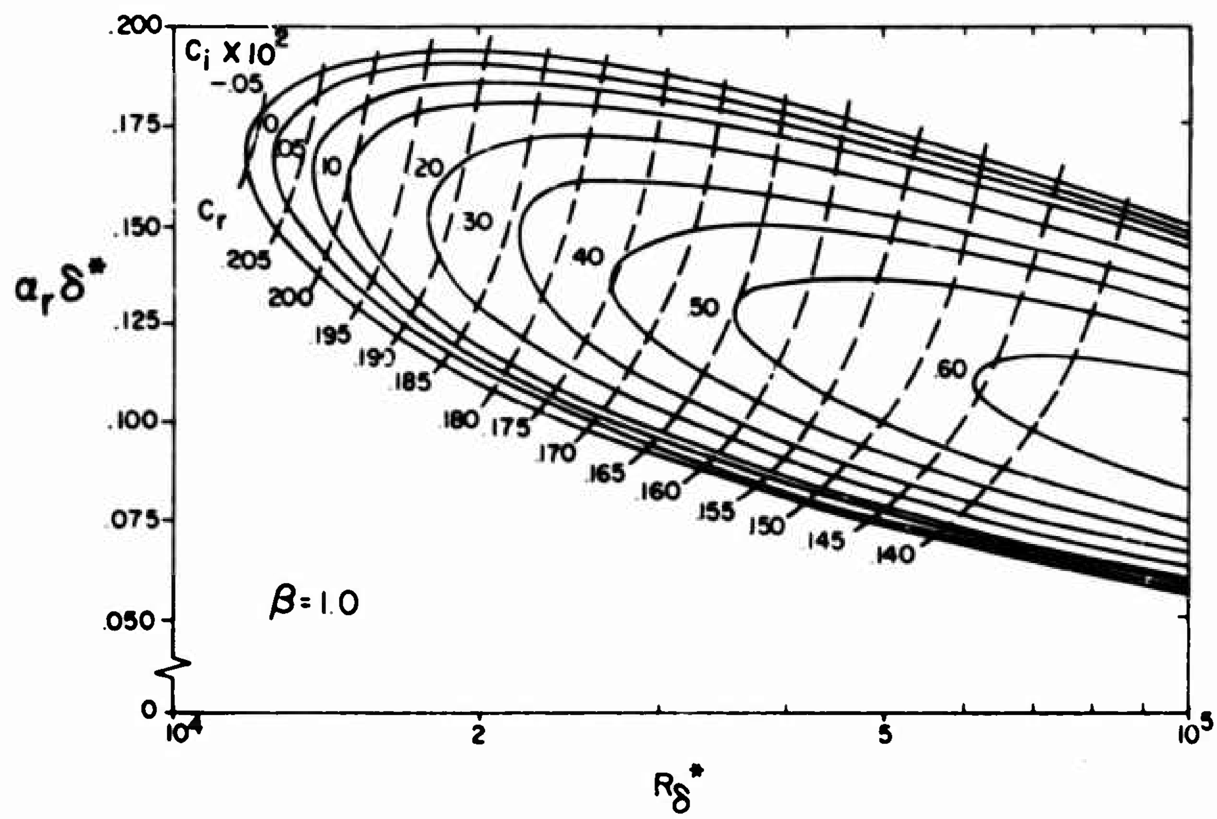

Fig. 13a Curves of constant temporal amplification rates (β = 1.0)

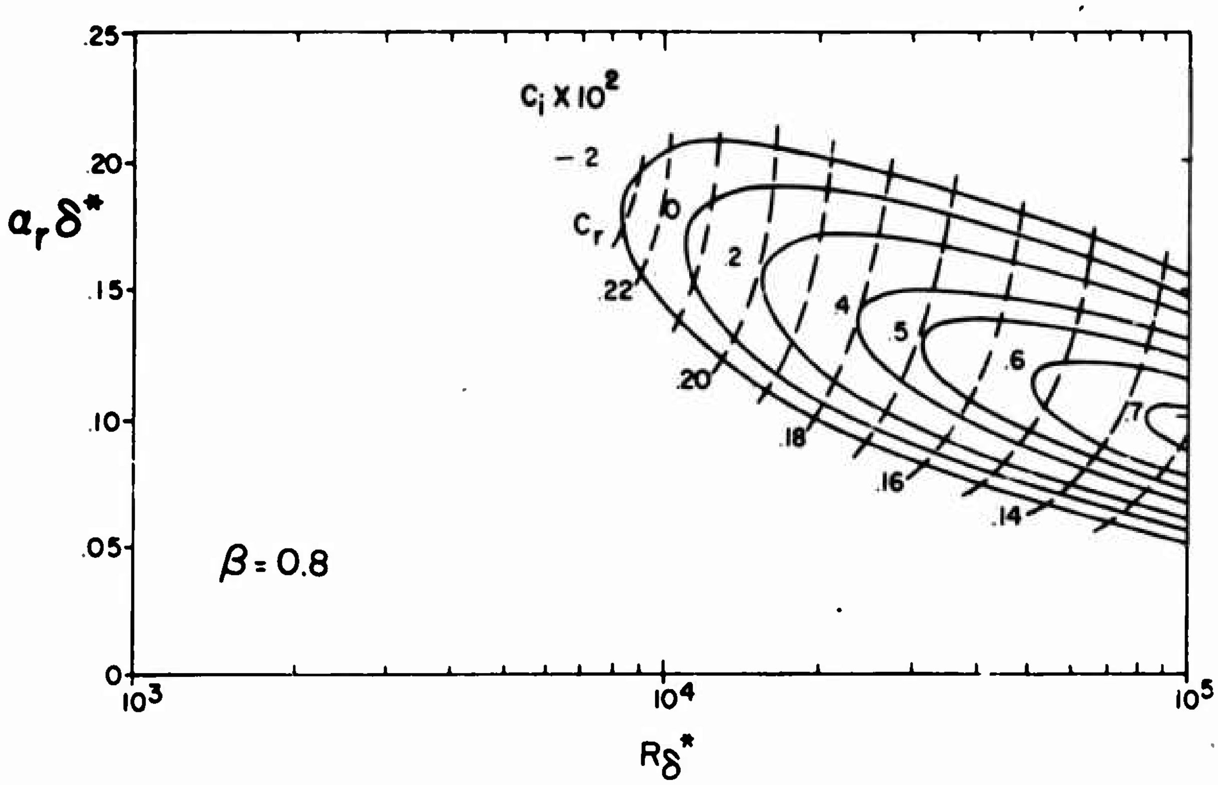

Fig. 13b Curves of constant temporal amplification rates (β = 0.8)

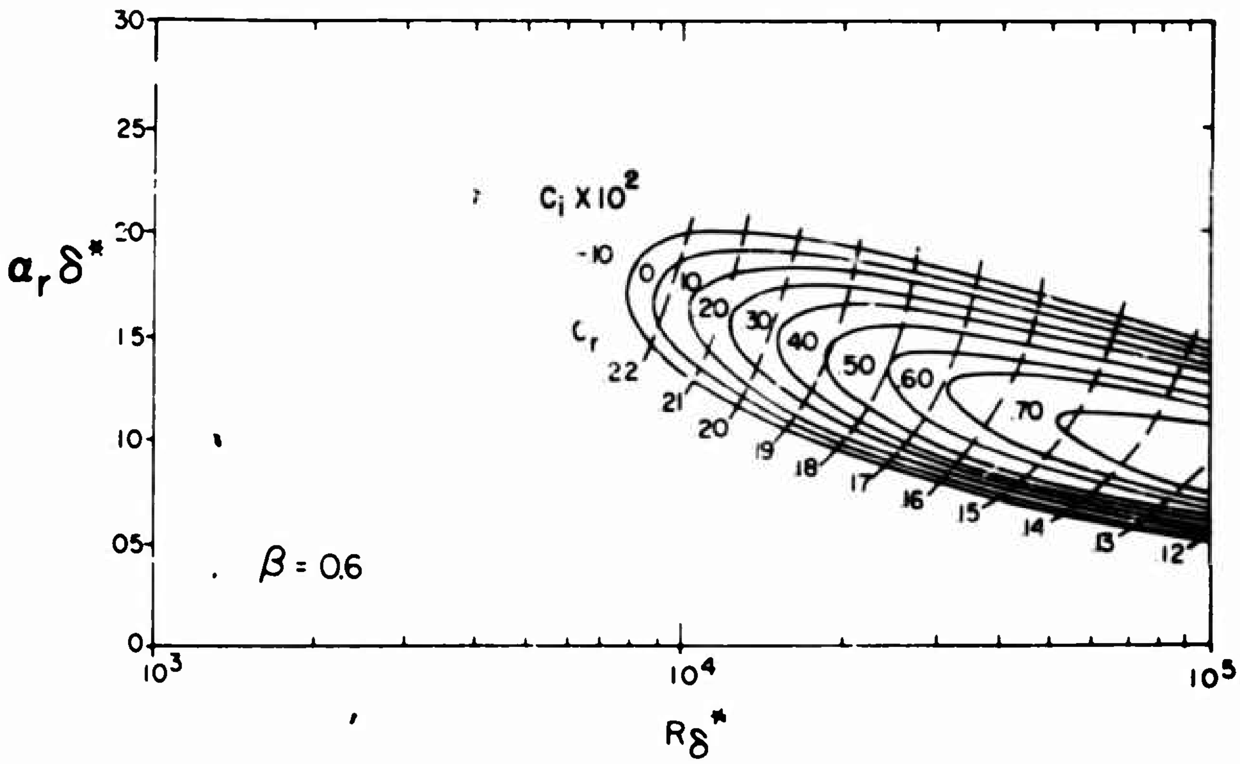

Fig. 13c Curves of constant temporal amplification rates (β = 0.6)

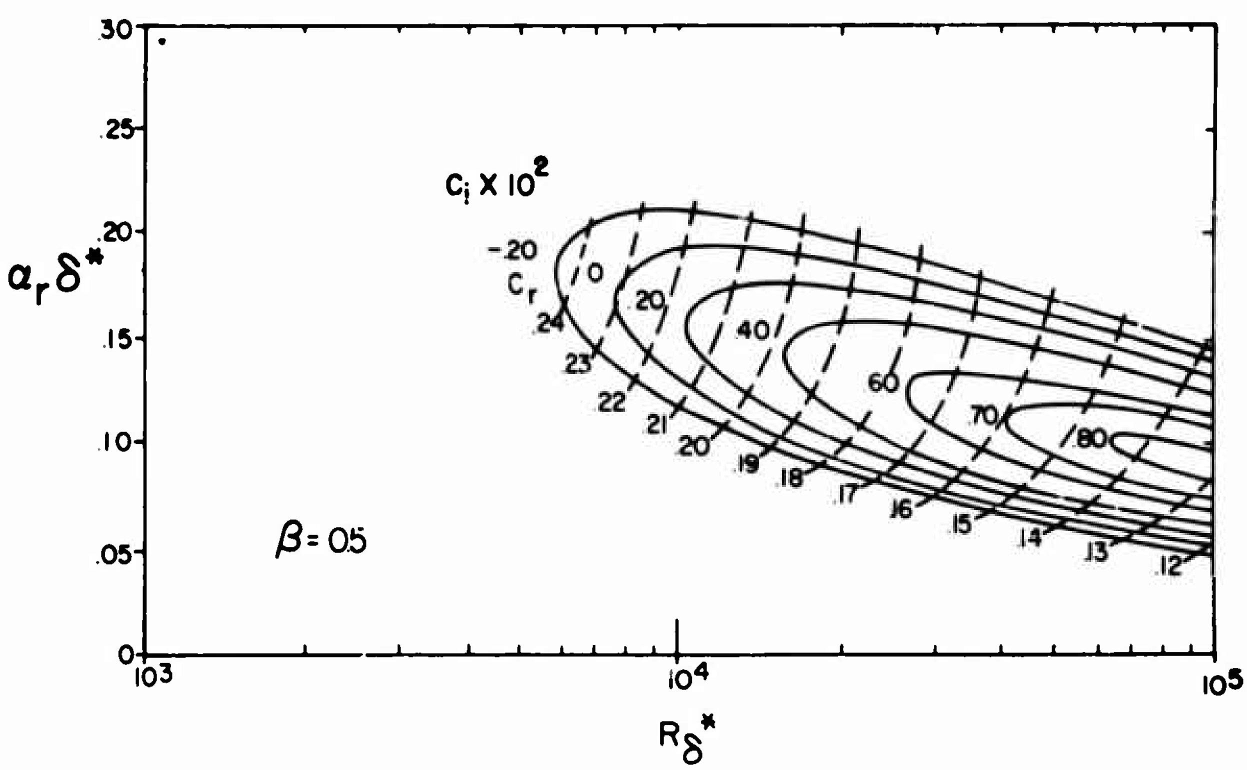

Fig. 13d Curves of constant temporal amplification rates (β = 0.5)

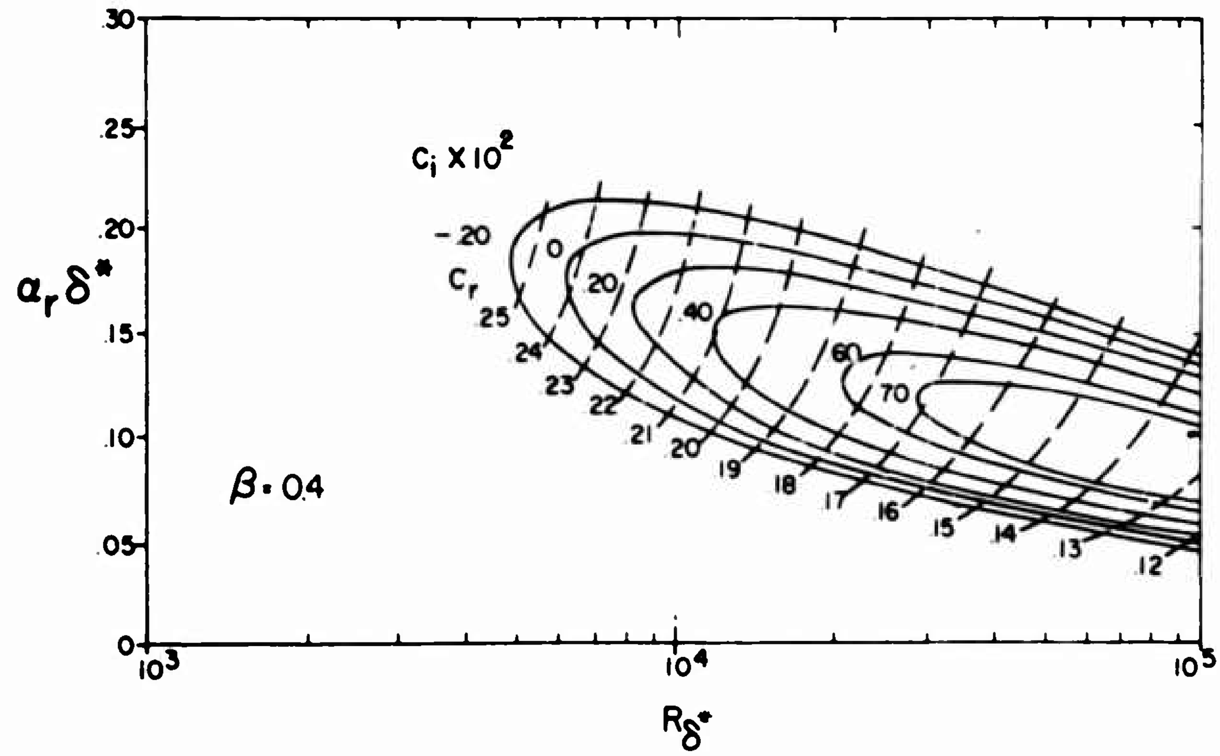

Fig. 13e Curves of constant temporal amplification rates (β = 0.4)

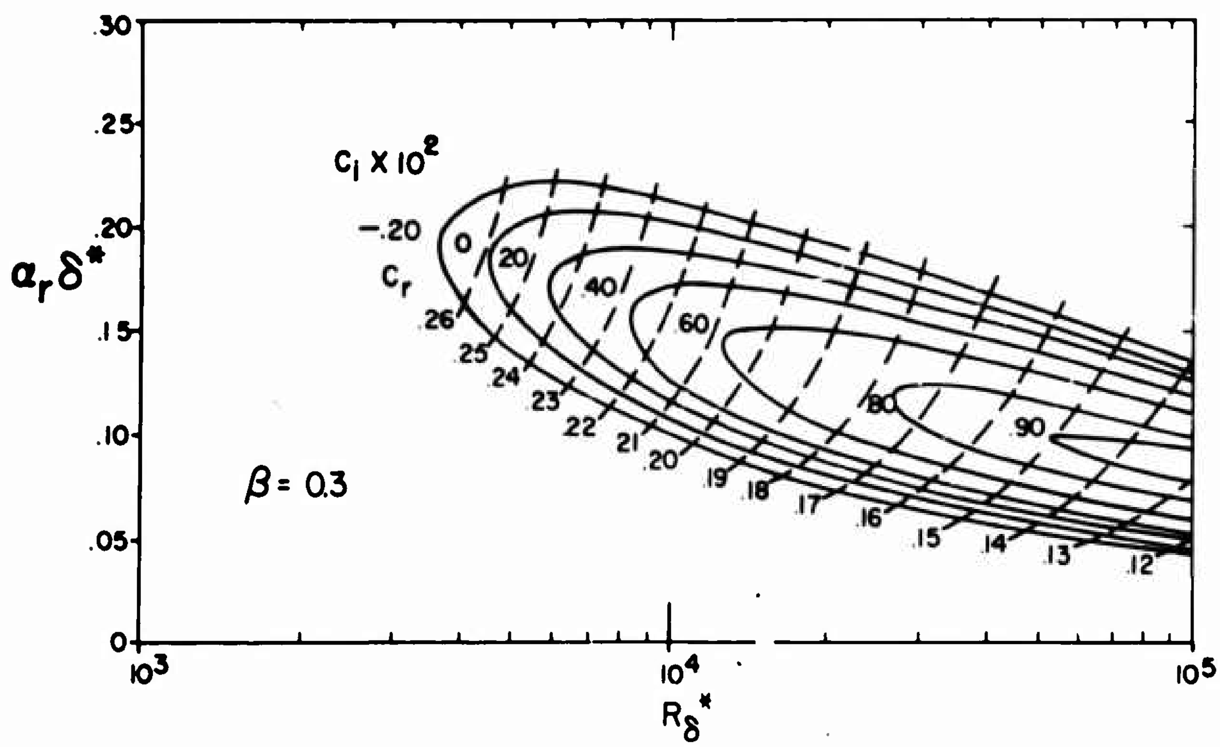

Fig. 13f Curves of constant temporal amplification rates (β = 0.3)

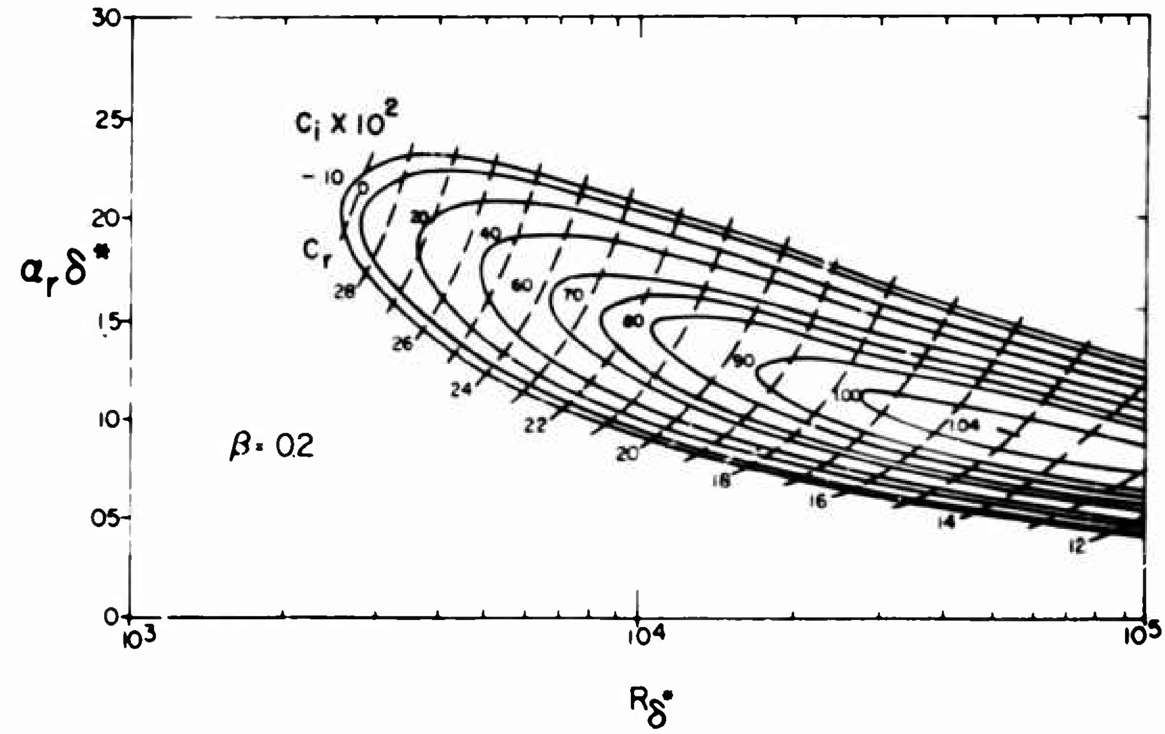

Fig. 13g Curves of constant temporal amplification rates (β = 0.2)

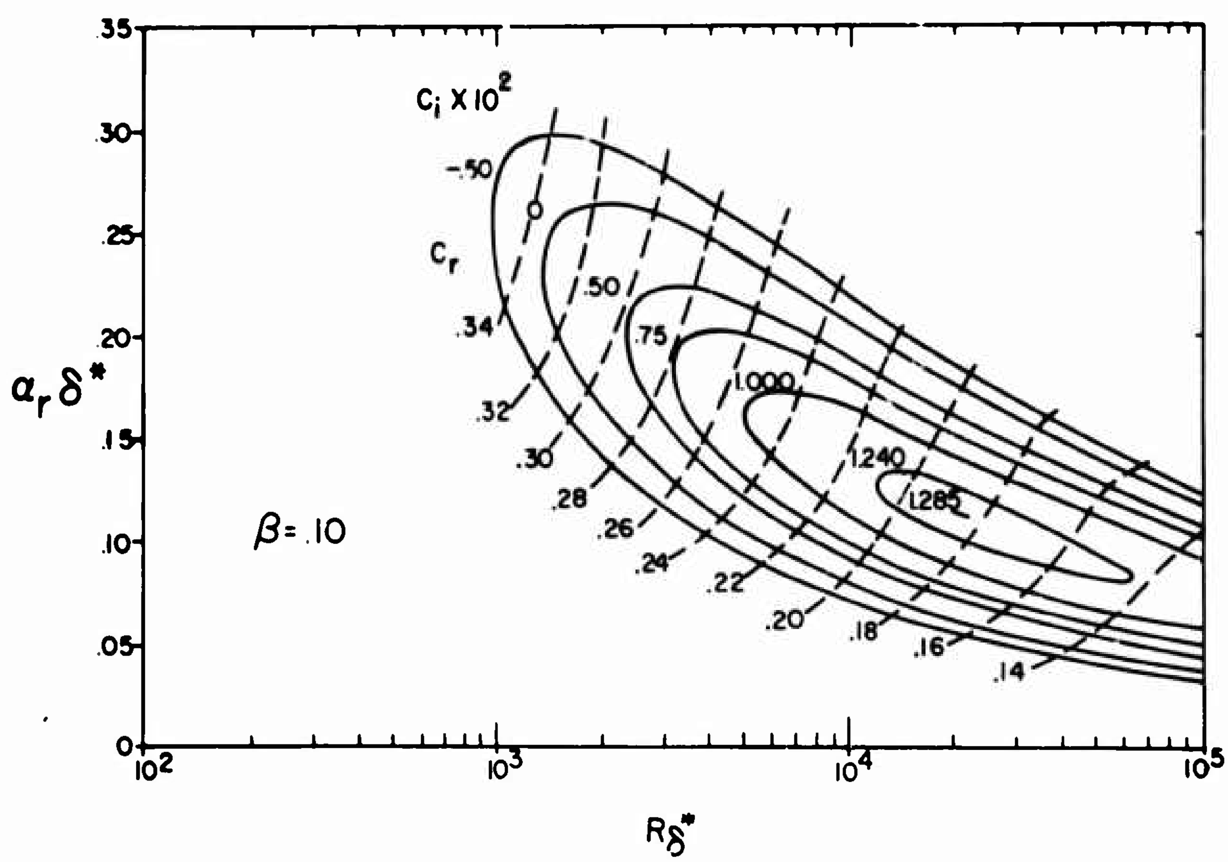

Fig. 13h Curves of constant temporal amplification rates (β = 0.1)

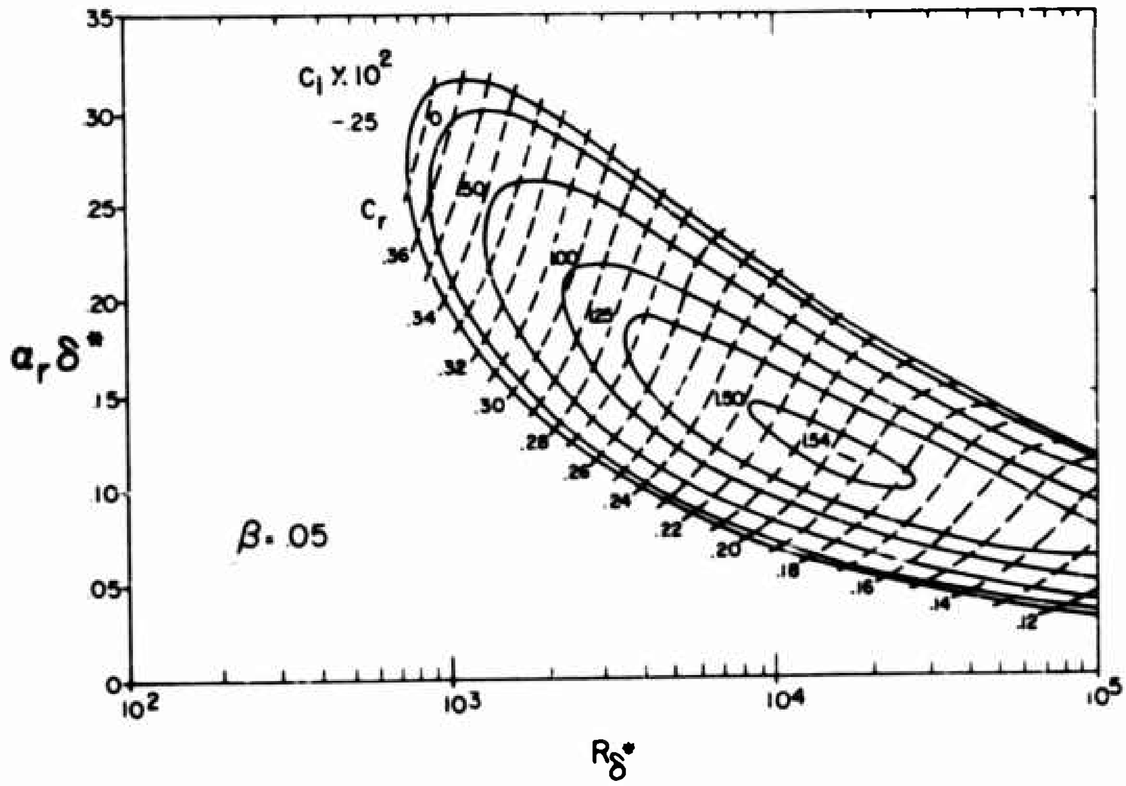

Fig. 13i Curves of constant temporal amplification rates (β = 0.05)

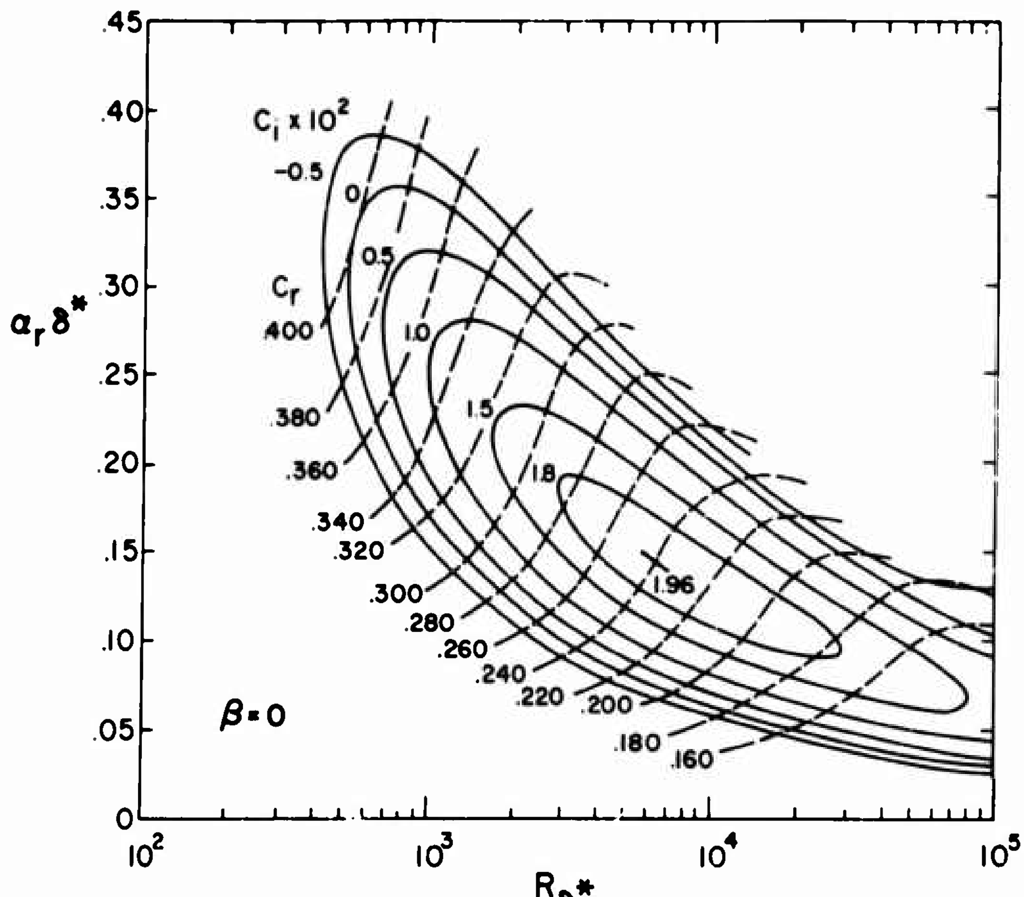

Fig. 13j Curves of constant temporal amplification rates (β = 0)

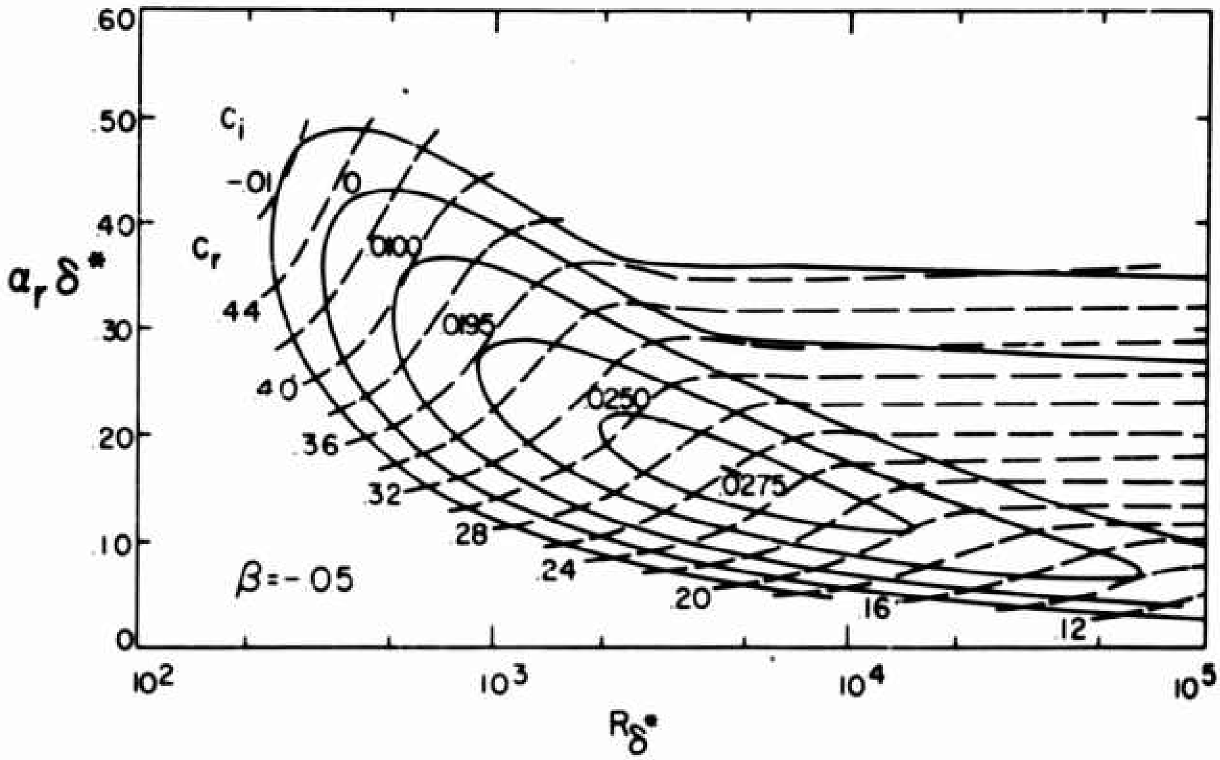

Fig. 13k Curves of constant temporal amplification rates (β = -0.05)

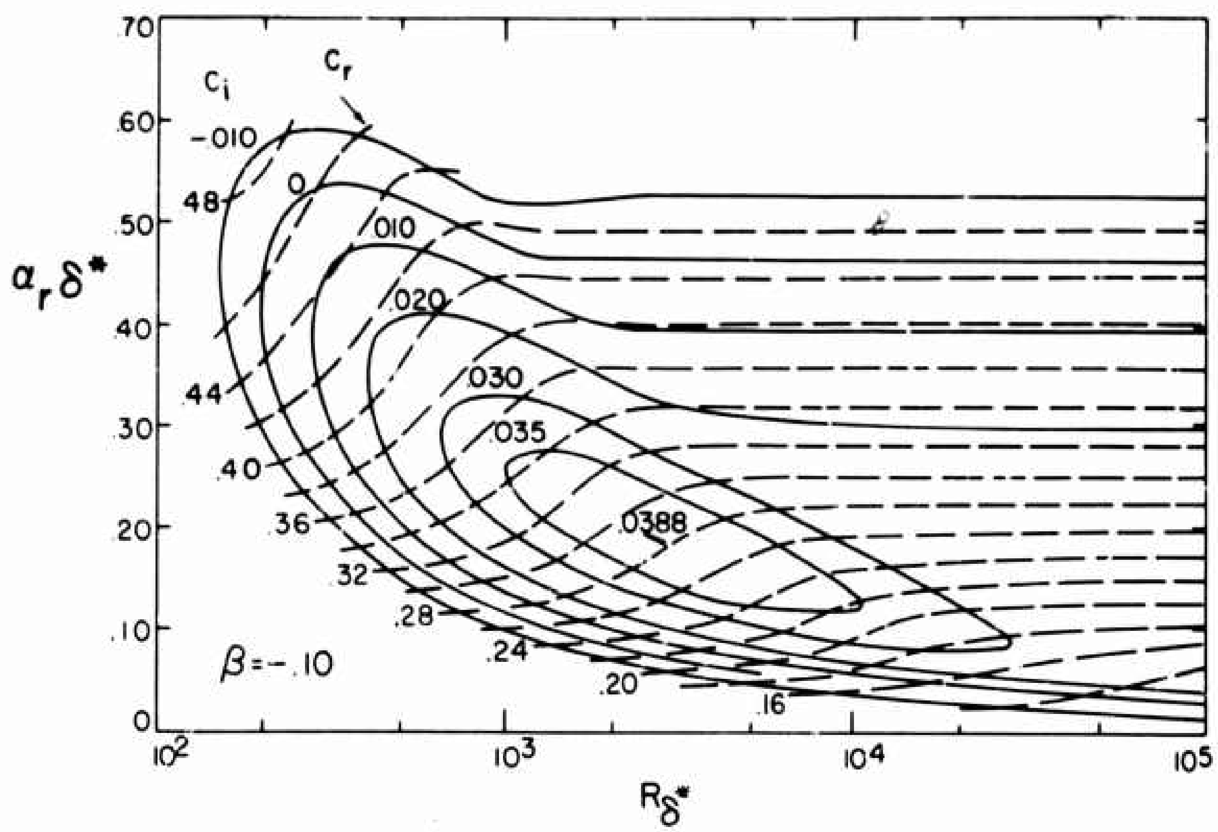

Fig. 13l Curves of constant temporal amplification rates (β = -0.10)

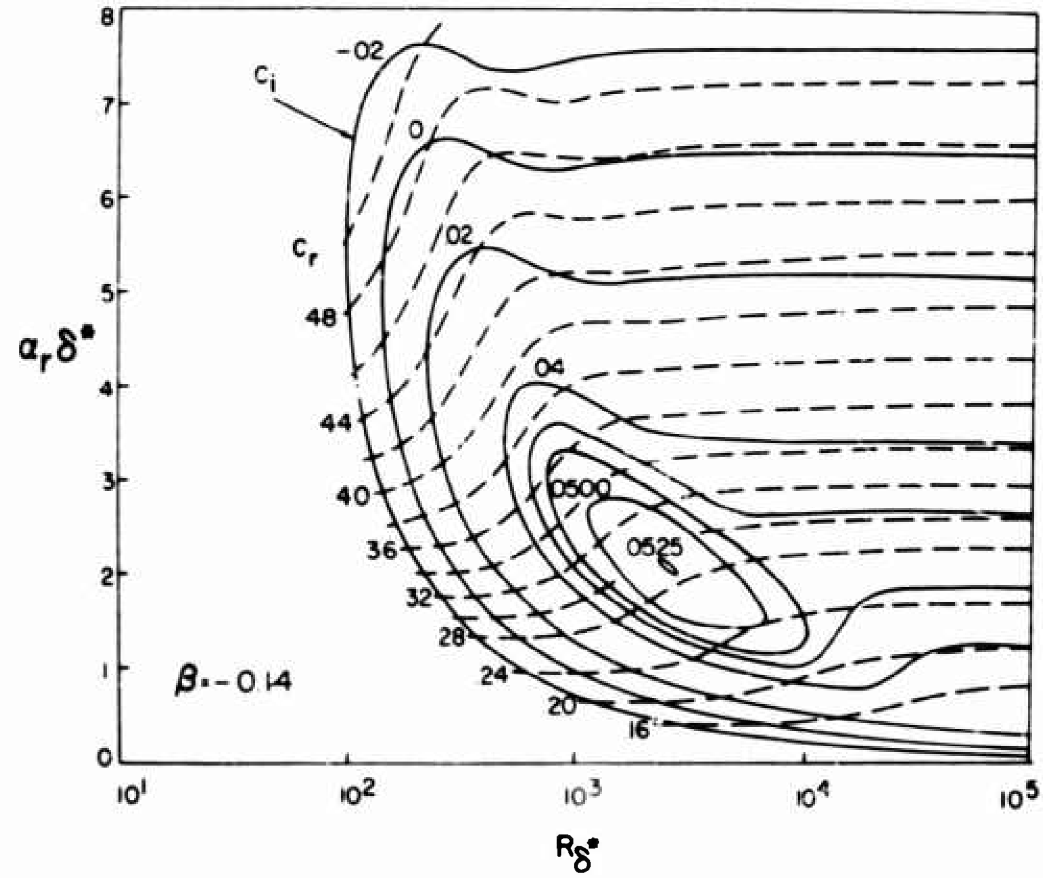

Fig. 13m Curves of constant temporal amplification rates (β = -0.14)

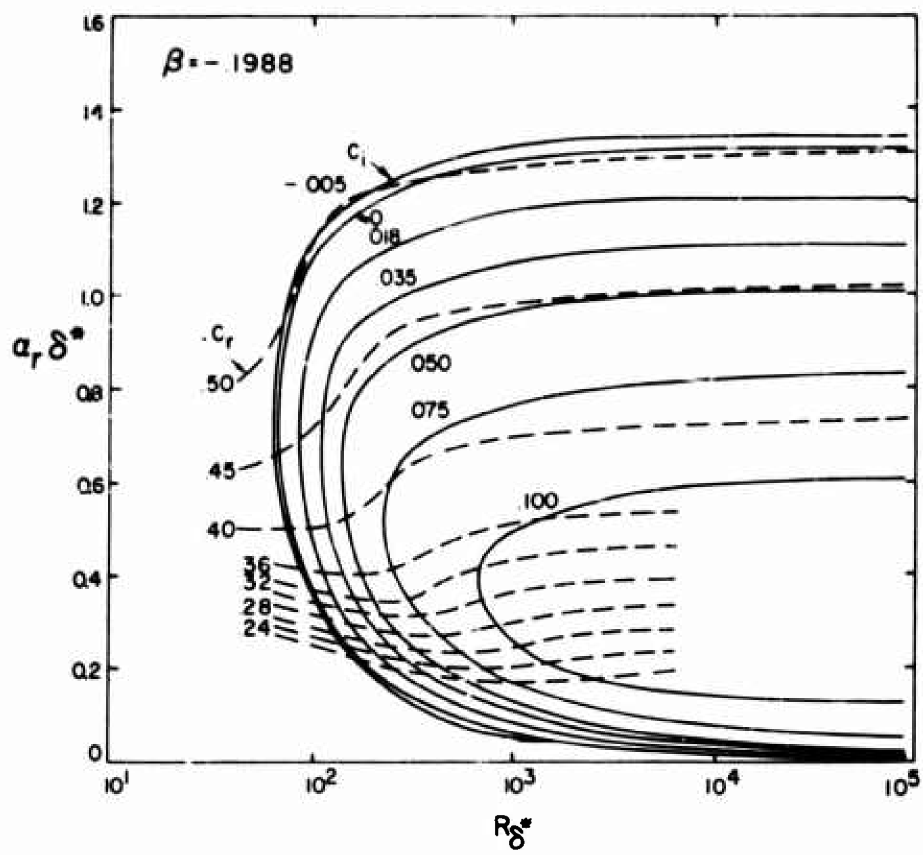

Fig. 13n Curves of constant temporal amplification rates (β = -0.1988)

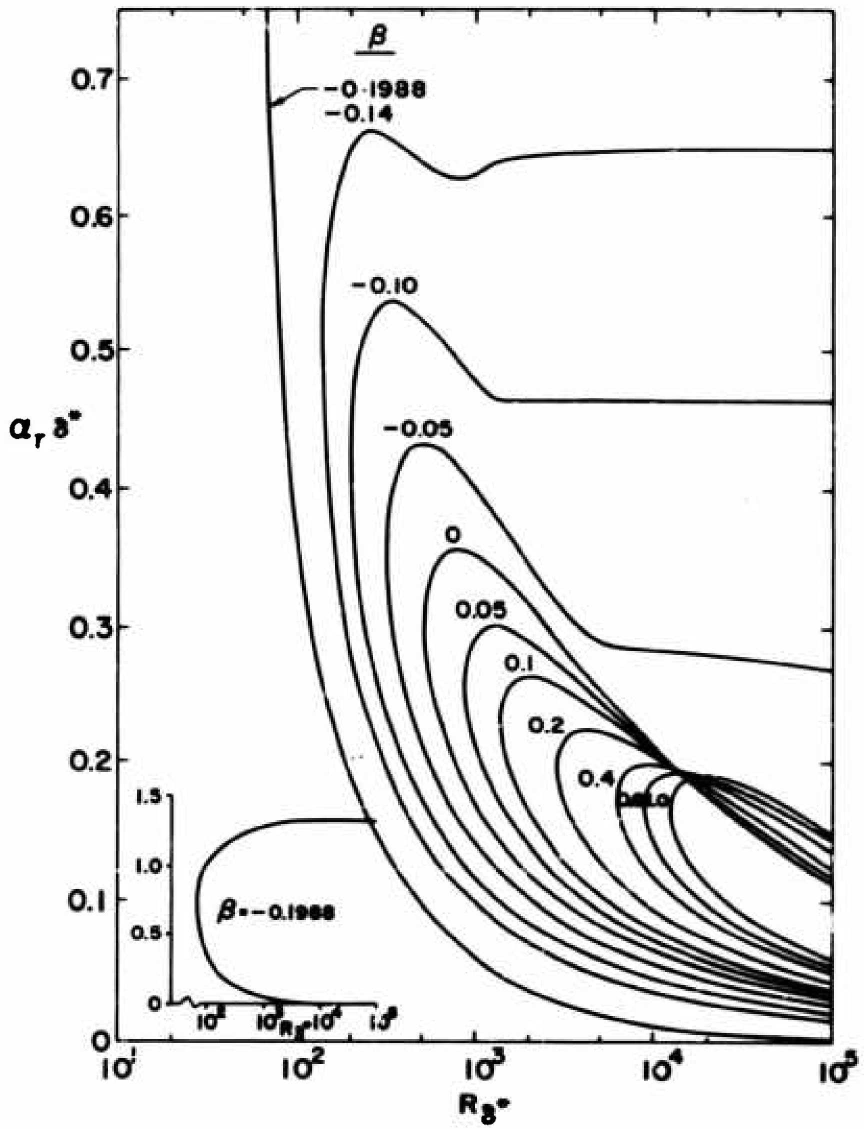

Fig. 14 Curves of neutral stability for the β boundary-layer profiles

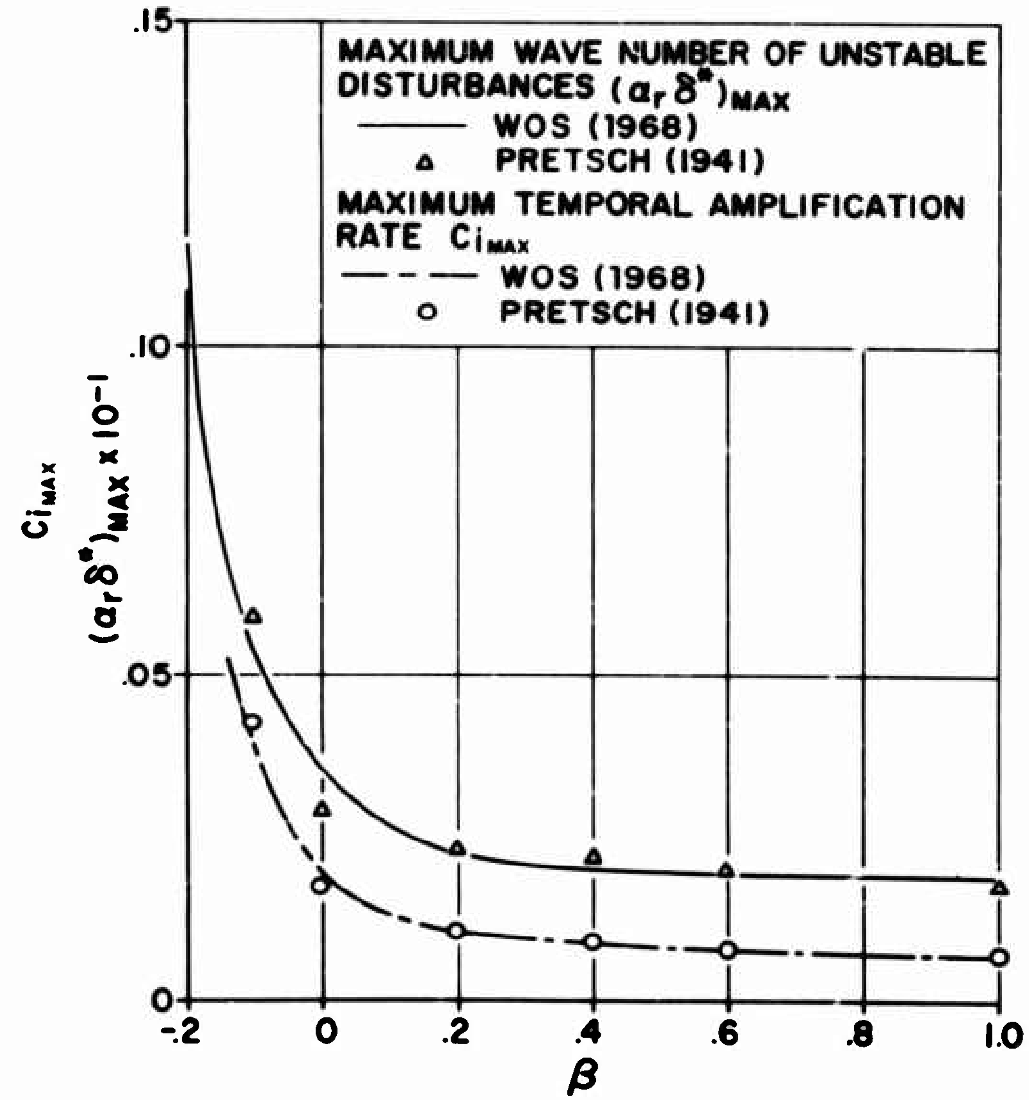

Fig. 15 Effect of pressure gradient on the maximum temporal amplification rate and wave number of unstable disturbances

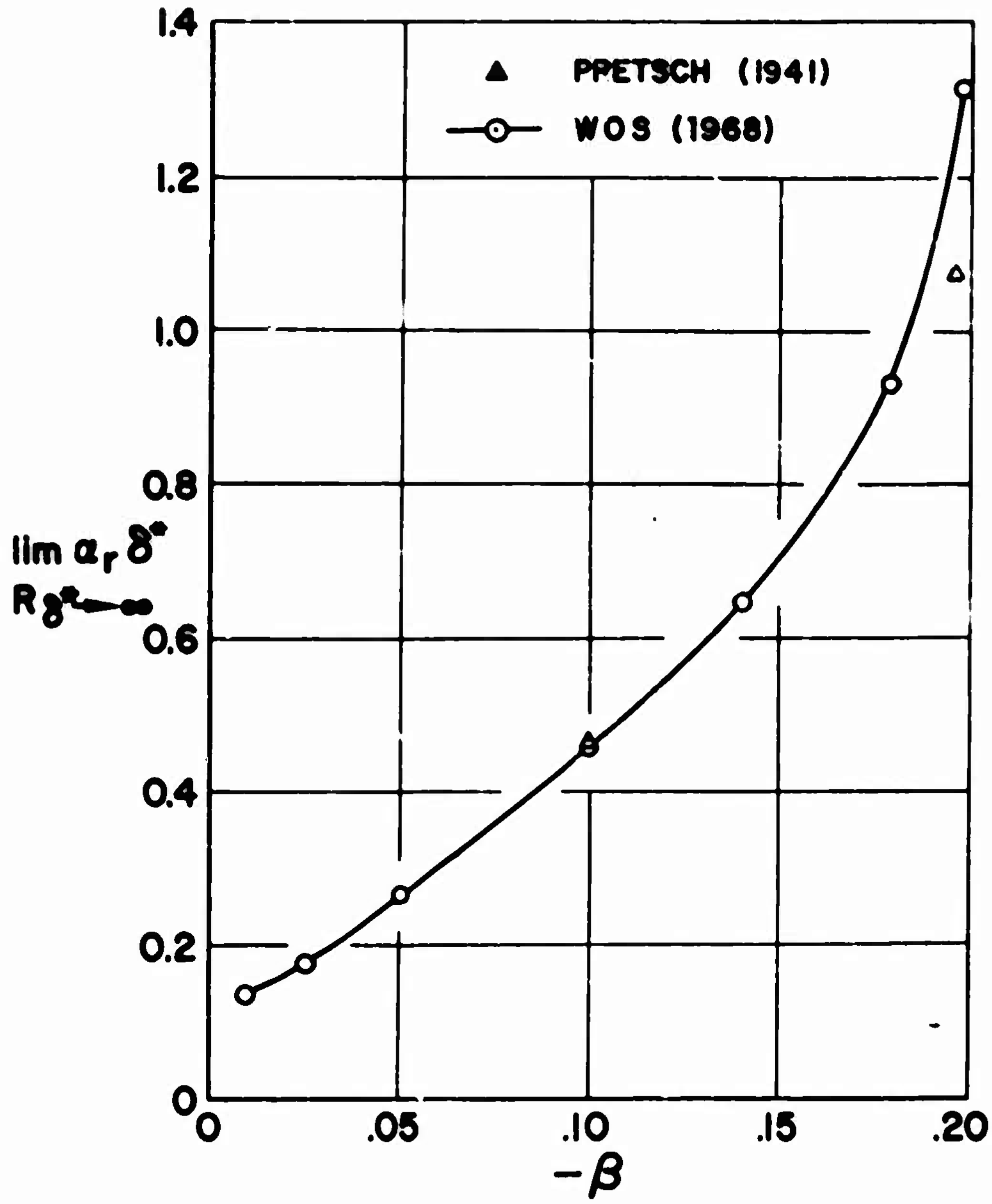

Fig. 16 The effect of adverse pressure gradient on the amplified wave number spectrum in the inviscid region

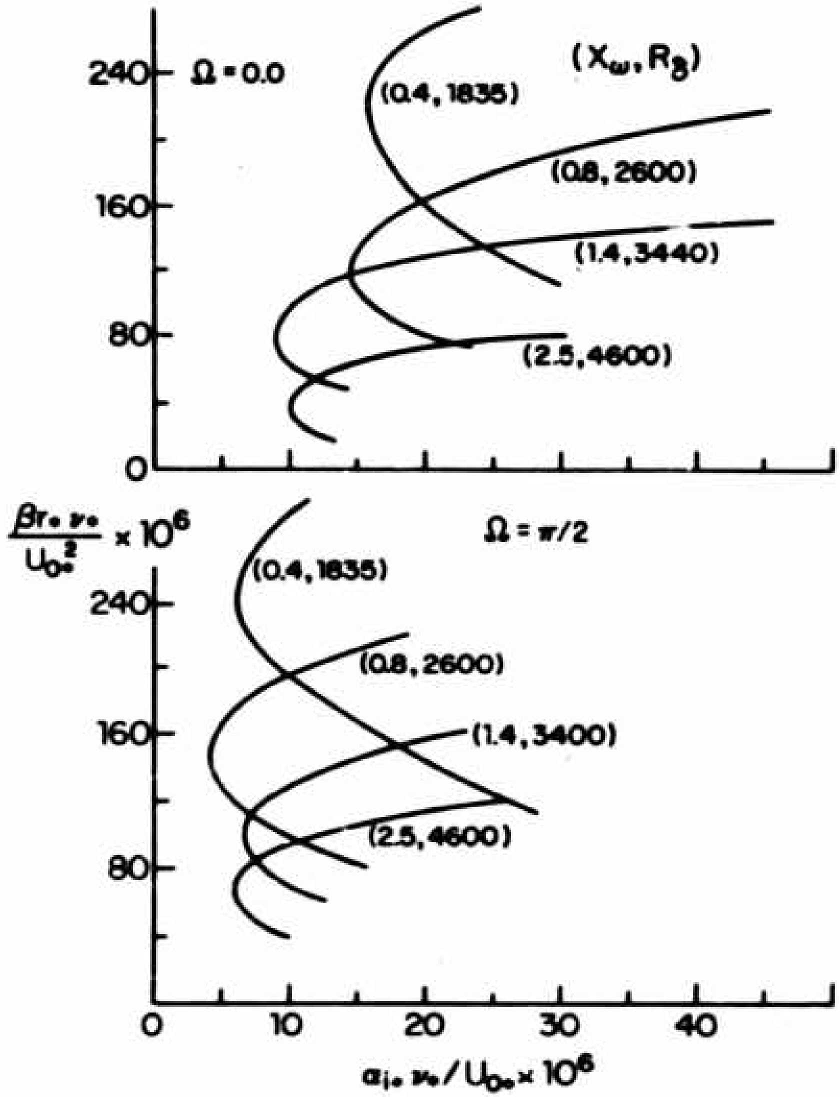

Fig. 17a and b Stability diagram, $R_{ns} = 35,000$, $N_A = 0.15$, $\Omega = 0$ and $\pi/2$

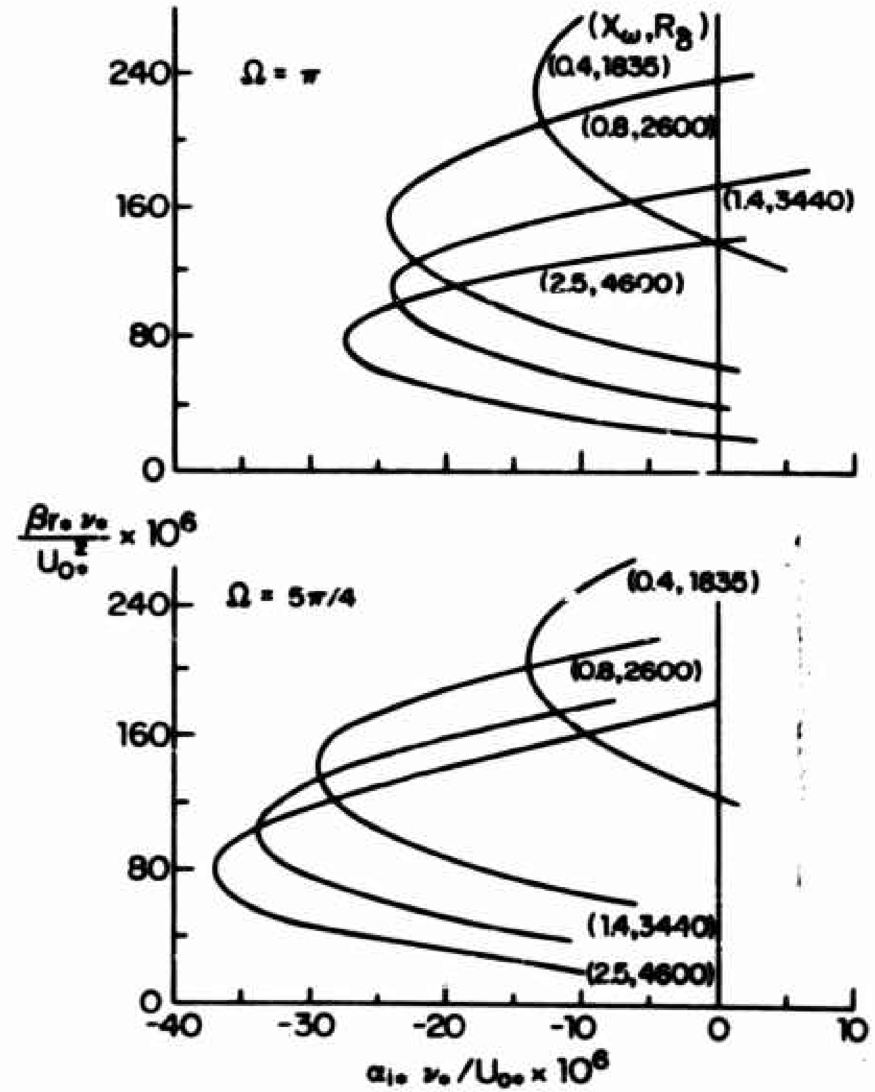

Fig. 17c and d Stability diagram, $R_{ns} = 35,000$, $N_A = 0.15$, $\Omega = \pi$ and $5\pi/4$

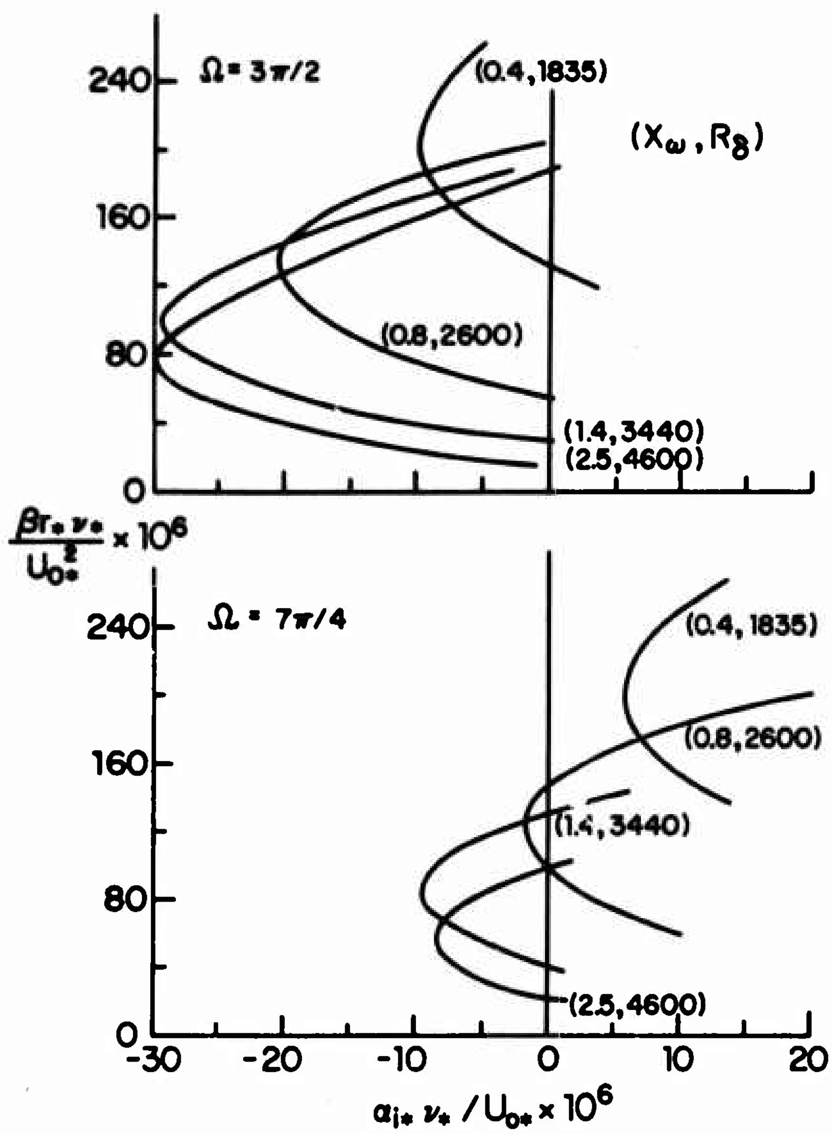

Fig. 17e and f Stability diagram, R_{ns} = 35,000 , N_A = 0.15 , $\Omega = 3\pi/2$ and $7\pi/4$

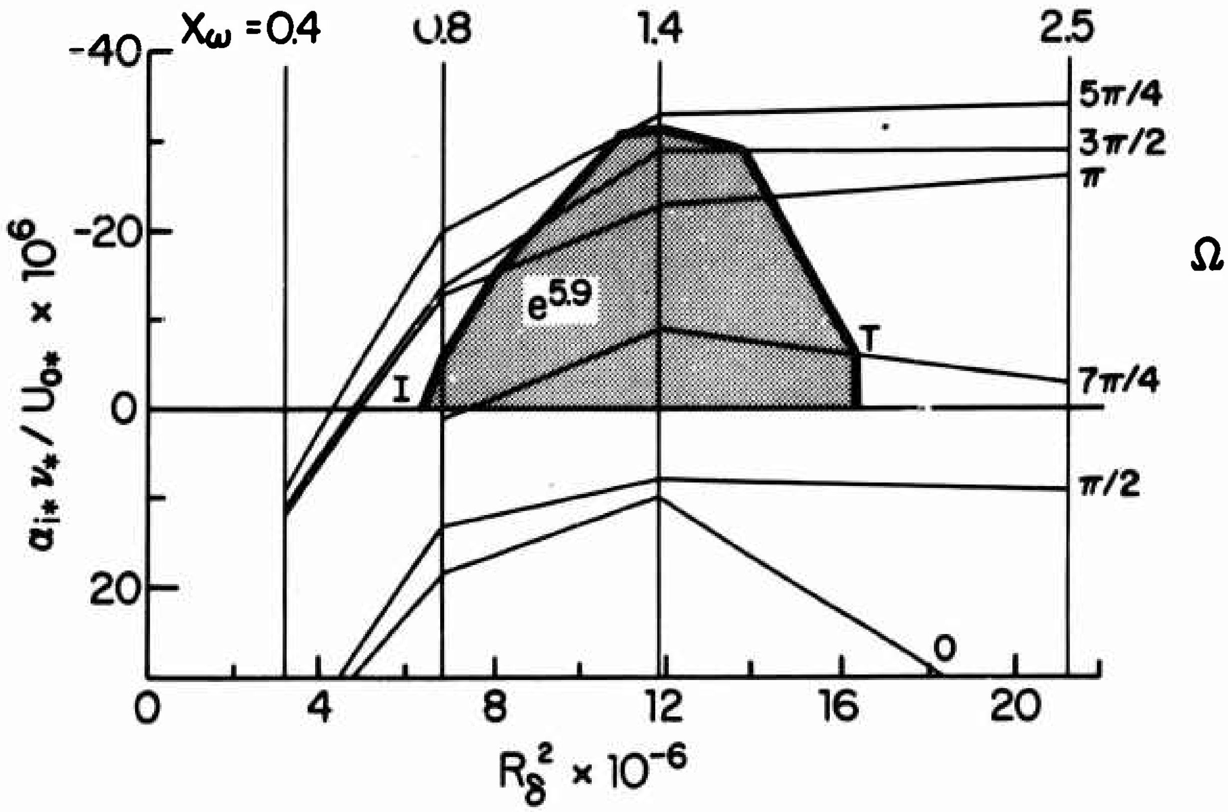

Fig. 18 Disturbance trajectory of a single disturbance frequency, $\beta_{r*}\nu_*/U_{0*}^2 = 90 \times 10^{-6}$, $R_{ns} = 35,000$, $N_A = 0.15$

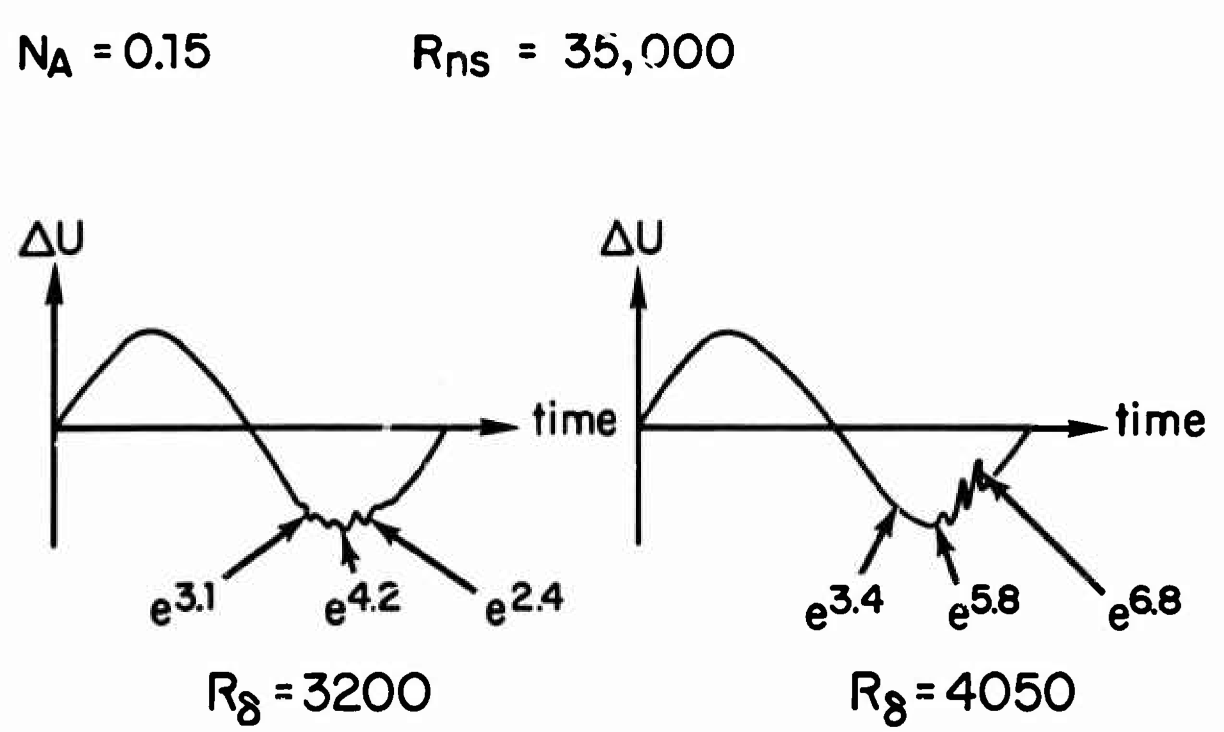

Fig. 19 Schematic of wave packet development

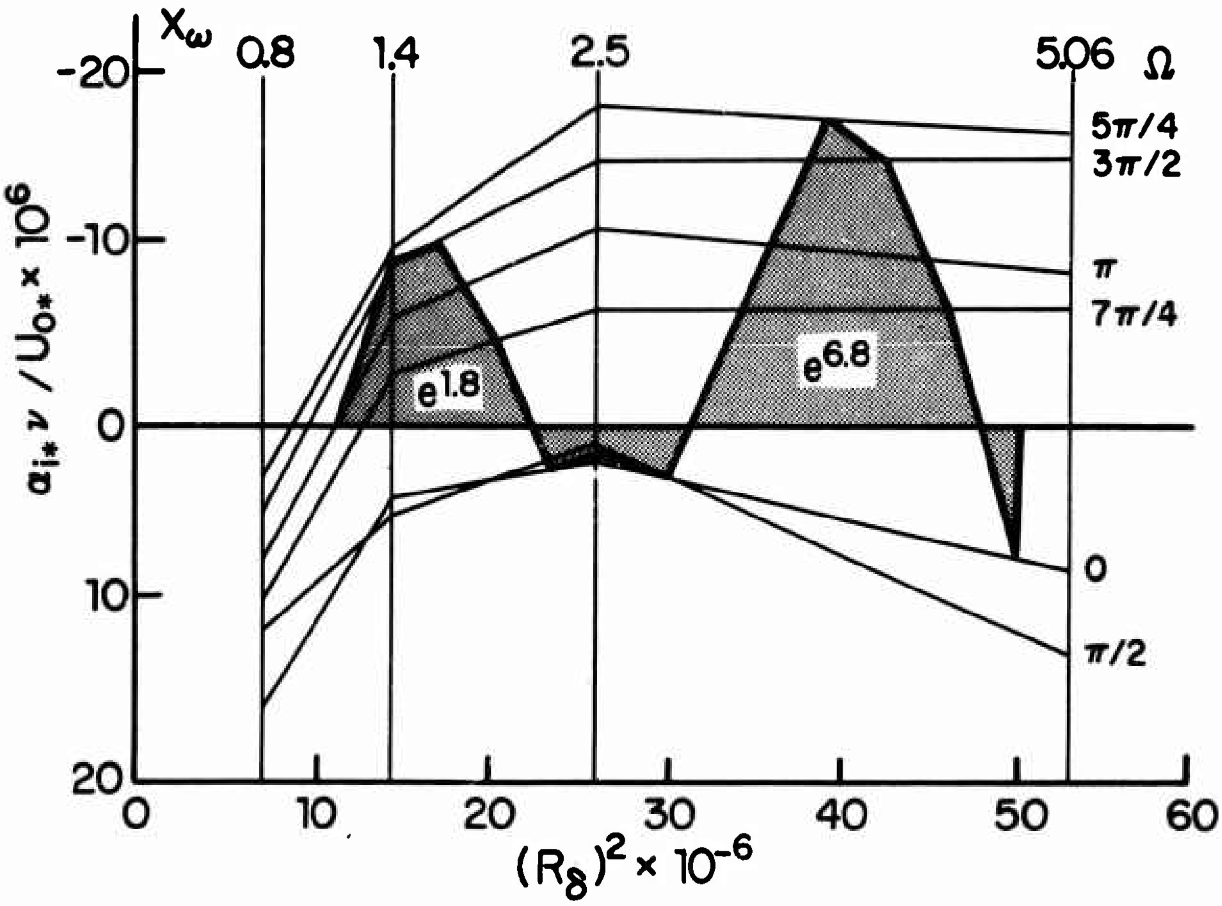

Fig. 20 Disturbance trajectory for a single disturbance frequency, $\beta_{r*}\nu_*/U_{0*}^2 = 50 \times 10^{-6}$, $R_{ns} = 21,600$, $N_A = 0.075$

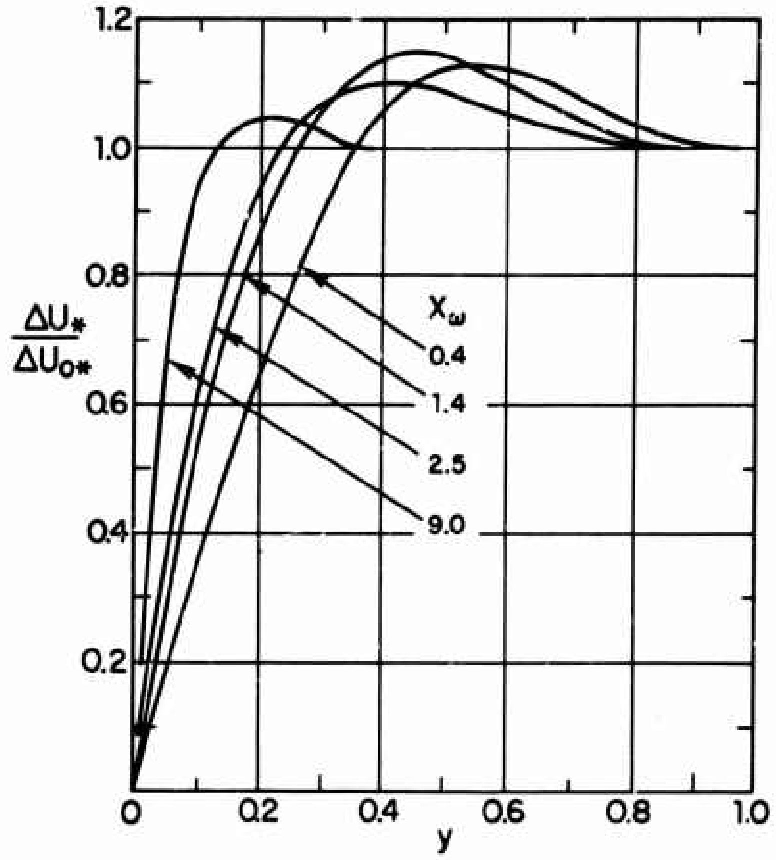

Fig. 21 Variation of amplitude across a periodic boundary layer

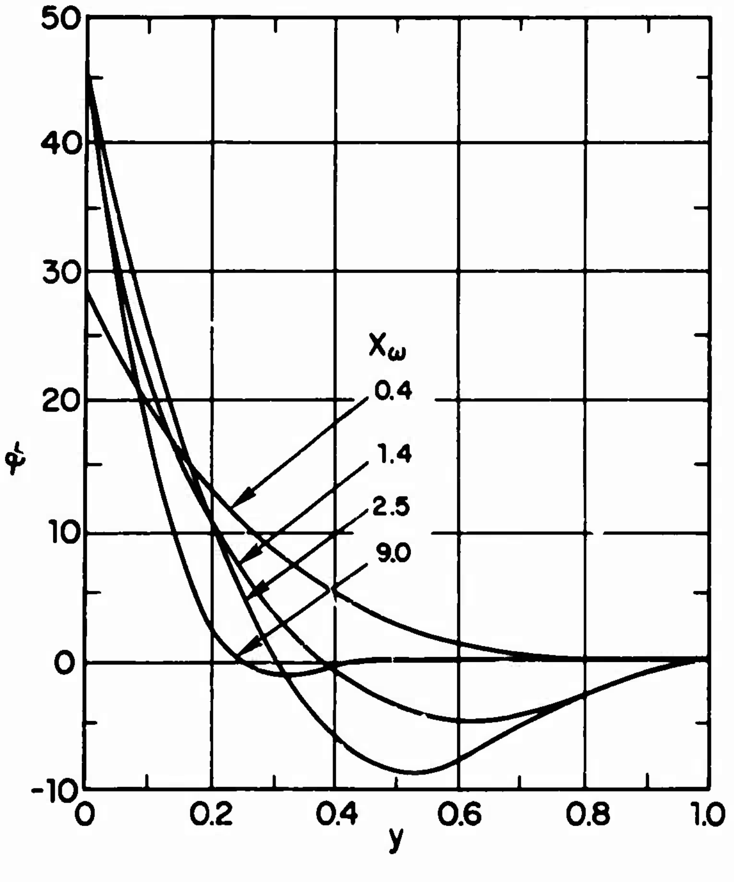

Fig. 22 Variation of velocity phase shift across a periodic boundary layer

TABLE I

Temporally and Spatially Varying Physical Disturbances

Temporal Wave	*Spatial Wave*
$v = \mathrm{Re}\left\{ v_1(y)\, e^{i(\alpha_r x - \omega_r t)}\; e^{\omega_i t} \right\}$	$v = \mathrm{Re}\left\{ v_1(y)\, e^{i(\alpha_r x - \omega_r t)}\; e^{-\alpha_i x} \right\}$
Fourier parameter $\alpha = \alpha_r$	$\omega = \omega_r$
eigenvalue $\omega(\alpha, R) = \omega_r + i\omega_i$	$\alpha(\omega, R) = \alpha_r + i\alpha_i$
phase velocity $c_r = \omega_r/\alpha_r$	$c_r = \omega_r/\alpha_r$, Note 2
group velocity $c_g = (\partial\omega_r/\partial\alpha_r)_R$	$c_g = (\partial\omega_r/\partial\alpha_r)_R$, Note 3
amplification rate $\omega_i = \alpha_r c_i > 0$ for instability	$-\alpha_i > 0$ for instability
total amplification $\log_e (A_2/A_1) = \int_{t_1}^{t_2} \omega_i \, dt$ $= \int_{x_1}^{x_2} \frac{\alpha_r c_i}{c_g} \, dx$ by Gaster Transformation	$\log_e (A_2/A_1) = - \int_{x_1}^{x_2} \alpha_i \, dx$
initial data given along x-axis	initial data given along t-axis

Gaster Transformation: $\alpha_r(T) = \alpha_r(S)$, $\omega_r(T) = \omega_r(S)$, $\frac{\omega_i(T)}{\alpha_i(S)} = -\left(\frac{\partial\omega_r}{\partial\alpha_r}\right)_R$. These relations hold to order $(\omega_{i\,max}^2)$.

Note 1. These relations are valid for all eigenmodes v_n of Equations (2t).

Note 2. $c_r = \omega_r/\alpha_r$ is the real physical phase velocity and is that used in the 0 family data. Betchov and Criminale[8] and WOS define a complex phase velocity by ω/α , i.e. by $\omega(\alpha_r - i\alpha_i)/|\alpha|^2$.

Note 3. Cases with $c_g < 0$, occasionally computed, require physical clarification. Some examples appear in Tables VI.

TABLE II

Characteristics of Three Constant $U''(0)$ Profiles

Profile	δ^*/θ	$y\vert_{U''=0}$	y_c	$U\vert_{U''=0}$	$(c_r)_c$	$(R_{\delta^*})_c$
(0.042, 9.0, π) "L"	2.66	0.14	0.19	0.23	0.36	650
(0.075, 5.06, π) "M"	2.69	0.16	0.20	0.28	0.38	440
(0.15, 2.5, π) "H"	2.86	0.20	0.225	0.33	0.42	250

TABLE III

Boundary-Layer Parameters for Various Values of β

β	η_δ	$\Delta^* = \int_0^\infty (1-F')\, d\eta$	$\theta = \int_0^\infty F'(1-F')\, d\eta$	H	$(R_{\delta *})_c$
1.0	3.143	0.6479	0.2923	2.216	12490
0.8	3.280	0.6987	0.3119	2.240	10920
0.6	3.440	0.7640	0.3359	2.274	8890
0.5	3.533	0.8046	0.3503	2.297	7680
0.4	3.636	0.8526	0.3667	2.325	6230
0.3	3.752	0.9110	0.3857	2.362	4550
0.2	3.887	0.9842	0.4082	2.411	2830
0.10	4.048	1.0803	0.4355	2.481	1380
0.05	4.145	1.1417	0.4515	2.529	865
0.0	4.257	1.2168	0.4696	2.591	520
-0.05	4.390	1.3124	0.4905	2.676	318
-0.10	4.561	1.4427	0.5150	2.801	199
-0.14	4.744	1.5459	0.5386	2.963	138
-0.1988	5.562	2.359	0.5854	4.029	67

TABLE IV

Results of Sample Amplification Calculation

Characteristics: $N_A = 0.15$; $R_{ns} = 35000$; $\omega = 14.7$ Hz

R_δ	Ω	$\log_e (A_T/A_I)$	$\beta_{r*}\nu_*/U_{0*}^2 \times 10^6$	
			Calculated	*Observed*
3200	$5\pi/4$	3.1	140	
	$3\pi/2$	4.2	140	150
	$7\pi/4$	2.4	120	
4050	$5\pi/4$	3.4	110	
	$3\pi/2$	5.8	110	
	$7\pi/4$	6.8	120	110

TABLE V

Instantaneous Velocity Profile Characteristics

$N_A = 0.075$

Ω \ X_ω	0.8			1.4			2.5			5.06			9.0		
	δ^*/δ	δ^*/θ	$(R_{\delta^*})_c$	δ^*/δ	δ^*/θ	$(R_{\delta^*})_c$	δ^*/δ	δ^*/θ	$(R_{\delta^*})_c$	δ^*/δ	δ^*/θ	$(R_{\delta^*})_c$	δ^*/δ	δ^*/θ	$(R_{\delta^*})_c$
0	0.283	2.521	$\simeq$ 850	0.286	2.502	$\simeq$ 1600	0.286	2.476	2200	0.280	2.502	2000	0.278	2.472	480
$\pi/2$	0.276	2.531	$\simeq$ 770	0.273	2.517	1040	0.273	2.492	1400	0.270	2.451	> 2700	0.271	2.422	> 2700
π	0.294	2.655	410	0.291	2.667	380	0.290	2.710	330	0.295	2.689	400	0.299	2.707	630
$5\pi/4$	0.304	2.669	$\simeq$ 360	0.302	2.726	$\simeq$ 300	0.302	2.768	250	0.307	2.805	270	0.311	2.842	330
$3\pi/2$	0.305	2.630	$\simeq$ 430	0.306	2.684	$\simeq$ 310	0.306	2.713	260	0.308	2.787	230	0.309	2.805	250
$7\pi/4$	0.296	2.564	590	0.299	2.584	$\simeq$ 600	0.300	2.581	480	0.296	2.653	260	0.295	2.634	240

$N_A = 0.15$

Ω \ X_ω	0.4			0.8			1.4			2.5			5.06		
	δ^*/δ	δ^*/θ	$(R_{\delta^*})_c$	δ^*/δ	δ^*/θ	$(R_{\delta^*})_c$	δ^*/δ	δ^*/θ	$(R_{\delta^*})_c$	δ^*/δ	δ^*/θ	$(R_{\delta^*})_c$	δ^*/δ	δ^*/θ	$(R_{\delta^*})_c$
0	0.279	2.514	860	0.278	2.460	$\simeq$ 1400	0.284	2.420	$\simeq$ 1700	0.285	2.374	$\simeq$ 2900			
$\pi/2$	0.267	2.579	640	0.262	2.544	1100	0.259	2.469	1500	0.260	2.424	2000			
π	0.298	2.665	370	0.299	2.729	280	0.292	2.781	280	0.291	2.858	250			
$5\pi/4$	0.315	2.684	380	0.321	2.779	260	0.318	2.902	190	0.317	3.013	180	0.329	3.112	$\simeq$ 214
$3\pi/2$	0.317	2.638	380	0.324	2.704	290	0.328	2.825	$\simeq$ 160	0.327	2.894	$\simeq$ 160			
$7\pi/4$	0.300	2.551	900	0.304	2.548	760	0.312	2.589	340	0.312	2.609	$\simeq$ 250			

TABLE VI

Stability Characteristics of the O Family Profiles

DATA TABLES NOMENCLATURE

NA	amplitude parameter, $\Delta U_{0\star}/U_{0\star}$
XW/U	frequency parameter, $x_\star \omega_\star / U_{0\star}$ or X_ω
WT	phase of free-stream oscillation, $\omega_\star t_\star$ or Ω
PROFILE COEFFICIENTS	coefficients in the series of Equation (A3) A_1, A_2, ..., A_n, $n = 6$ or 8
RE(DELTA)	Reynolds number based on δ, $6(x_\star \nu_\star / U_{0\star})^{\frac{1}{2}}$
BETAR*DELTA/U	disturbance frequency, $\beta_{r\star}\delta_\star/U_{0\star}$
ALFAR*DELTA	disturbance wave number, $\alpha_{r\star}\delta_\star$
BETAR*NU/U**2	disturbance frequency, $\beta_{r\star}\nu_\star/U_{0\star}^2$
ALFAI*NU/U	spatial amplification rate, $\alpha_{i\star}\nu_\star/U_{0\star}$
GROUP VEL.	group velocity, c_g
WAVE VEL.	wave velocity, c_r
CITMP	temporal amplification rate derived through the Gaster transformation of the spatial amplification rate, $-\alpha_i c_g/\alpha_r$
TEMPORAL DATA	data under the designated values of the unsteady parameters were derived from a temporal analysis of OS equation
BETAI*NU/U**2	temporal amplification rate, $\beta_{i\star}\nu_\star/U_{0\star}^2$
CIMAG	imaginary part of the temporal complex wave speed, $\beta_{i\star}/\alpha_{r\star}U_{0\star}$
ALFAI*NU/U	spatial amplification rate derived through the Gaster transformation of the temporal amplification rate, $-\beta_{i\star}\nu_\star/U_{0\star}^2 c_g$
HIGHER MODE SOLUTIONS	spatially derived eigenvalues of a higher mode solution
TEMPORAL DATA, HIGHER MODE SOLUTIONS	temporally derived eigenvalues of a higher mode solution

NA = 0.0420 XW/U = 9.0000 WT = 3.1416

PROFILE COEFFICIENTS -0.63660 6.81090 -29.68100 80.15501-135.02001 133.50003 -70.33601 15.22800

RE(DELTA) = 2200.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.500	1.3324	0.2272E-03	0.7590E-05	0.4212	0.3752	-0.527E-02
0.450	1.2138	0.2045E-03	0.2000E-05	0.4201	0.3707	-0.152E-02
0.400	1.0944	0.1818E-03	-0.1045E-05	0.4191	0.3654	0.880E-03
0.350	0.9752	0.1590E-03	-0.1136E-05	0.4189	0.3589	0.107E-02
0.300	0.8557	0.1363E-03	0.1409E-05	0.4180	0.3505	-0.151E-02
0.250	0.7360	0.1136E-03	0.6363E-05	0.4171	0.3396	-0.793E-02

RE(DELTA) = 4500.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.7248	0.1333E-03	0.4517E-04	0.4067	0.3478	-0.479E-01
0.450	1.3492	0.1000E-03	0.5733E-05	0.3799	0.3335	-0.726E-02
0.400	1.2153	0.8888E-04	-0.3933E-05	0.3709	0.3291	0.540E-02
0.350	1.0796	0.7777E-04	-0.7777E-05	0.3659	0.3241	0.118E-01
0.300	0.9420	0.6666E-04	-0.9222E-05	0.3635	0.3184	0.160E-01
0.250	0.8045	0.5555E-04	-0.8333E-05	0.3629	0.3107	0.169E-01
0.200	0.6665	0.4444E-04	-0.5311E-05	0.3597	0.3000	0.129E-01
0.100	0.3845	0.2222E-04	0.5733E-05	0.3532	0.2600	-0.237E-01

RE(DELTA) = 6000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.400	1.2638	0.6666E-04	-0.5666E-06	0.3615	0.3165	0.972E-03
0.350	1.1244	0.5833E-04	-0.5683E-05	0.3542	0.3112	0.107E-01
0.300	0.9815	0.4999E-04	-0.8233E-05	0.3470	0.3056	0.174E-01
0.250	0.8362	0.4166E-04	-0.8683E-05	0.3438	0.2989	0.214E-01
0.200	0.6907	0.3333E-04	-0.6999E-05	0.3424	0.2895	0.208E-01
0.150	0.5442	0.2499E-04	-0.3483E-05	0.3382	0.2756	0.129E-01
0.100	0.3950	0.1666E-04	0.1500E-06	0.3339	0.2531	-0.760E-03

NA = 0.0420 XW/U = 9.0000 WT = 3.1416 (TEMPORAL DATA)

PROFILE COEFFICIENTS -0.63660 6.81090 -29.68100 80.15501-135.02001 133.50003 -70.33601 15.22800

RE(DELTA) = 1500.

ALFAR*DELTA	BETAR*NU/U**2	BETAI*NU/U**2	CIMAG	GROUP VEL.	WAVE VEL.	ALFAI*NU/U
1.4000	0.3743E-03	-0.1343E-04	-0.0144	0.4421	0.4011	0.3037E-04
1.3000	0.3448E-03	-0.1022E-04	-0.0118	0.4447	0.3979	0.2299E-04
1.2000	0.3150E-03	-0.8193E-05	-0.0102	0.4472	0.3938	0.1831E-04
1.1000	0.2852E-03	-0.7313E-05	-0.0099	0.4487	0.3889	0.1629E-04
1.0000	0.2552E-03	-0.7599E-05	-0.0114	0.4485	0.3829	0.1694E-04
0.9000	0.2254E-03	-0.8820E-05	-0.0147	0.4460	0.3757	0.1977E-04
0.8000	0.1957E-03	-0.1087E-04	-0.0204	0.4413	0.3671	0.2464E-04
0.7000	0.1665E-03	-0.1334E-04	-0.0290	0.4367	0.3569	0.3101E-04

RE(DELTA) = 3000.

ALFAR*DELTA	BETAR*NU/U**2	BETAI*NU/U**2	CIMAG	GROUP VEL.	WAVE VEL.	ALFAI*NU/U
1.4000	0.1663E-03	-0.2826E-05	-0.0060	0.3784	0.3565	0.7469E-05
1.3000	0.1536E-03	-0.3600E-06	-0.0008	0.3847	0.3546	0.9355E-06
1.2000	0.1407E-03	0.1403E-05	0.0035	0.3911	0.3518	-0.3587E-05
1.1000	0.1276E-03	0.2509E-05	0.0068	0.3960	0.3480	-0.6338E-05
1.0000	0.1143E-03	0.2869E-05	0.0086	0.3974	0.3429	-0.7221E-05
0.9000	0.1011E-03	0.2663E-05	0.0088	0.3960	0.3370	-0.6724E-05
0.8000	0.8792E-04	0.1756E-05	0.0065	0.3928	0.3297	-0.4471E-05
0.7000	0.7492E-04	0.3999E-06	0.0017	0.3857	0.3211	-0.1036E-05
0.6000	0.6220E-04	-0.1336E-05	-0.0066	0.3786	0.3110	0.3530E-05

NA = 0.0750   XW/U = 0.8000   WT = 0.0000

PROFILE COEFFICIENTS   0.23943   -1.07040   2.60820   6.07830   -34.85000   54.47600   -36.77500   9.31120

RE(DELTA) = 1620.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.4836	0.4012E-03	0.4956E-04	0.5111	0.4381	-0.276E-01
0.600	1.3855	0.3703E-03	0.3783E-04	0.5033	0.4330	-0.222E-01
0.550	1.2849	0.3395E-03	0.2870E-04	0.4955	0.4280	-0.179E-01
0.500	1.1837	0.3086E-03	0.2265E-04	0.4911	0.4224	-0.152E-01
0.450	1.0813	0.2777E-03	0.1932E-04	0.4873	0.4161	-0.141E-01
0.400	0.9785	0.2469E-03	0.1858E-04	0.4835	0.4087	-0.148E-01
0.350	0.8745	0.2160E-03	0.2012E-04	0.4791	0.4002	-0.178E-01
0.300	0.7698	0.1851E-03	0.2376E-04	0.4735	0.3897	-0.236E-01
0.250	0.6633	0.1543E-03	0.2919E-04	0.4636	0.3769	-0.330E-01
0.200	0.5541	0.1234E-03	0.3574E-04	0.4538	0.3609	-0.474E-01

RE(DELTA) = 2090.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5282	0.3110E-03	0.4942E-04	0.5088	0.4253	-0.343E-01
0.600	1.4295	0.2870E-03	0.3550E-04	0.4948	0.4197	-0.256E-01
0.550	1.3260	0.2631E-03	0.2435E-04	0.4807	0.4147	-0.184E-01
0.500	1.2215	0.2392E-03	0.1650E-04	0.4739	0.4093	-0.133E-01
0.450	1.1150	0.2153E-03	0.1143E-04	0.4686	0.4035	-0.100E-01
0.400	1.0081	0.1913E-03	0.9043E-05	0.4644	0.3967	-0.870E-02
0.350	0.8997	0.1674E-03	0.8995E-05	0.4599	0.3890	-0.961E-02
0.300	0.7907	0.1435E-03	0.1110E-04	0.4551	0.3794	-0.133E-01
0.250	0.6800	0.1196E-03	0.1511E-04	0.4480	0.3676	-0.208E-01
0.200	0.5675	0.9569E-04	0.2057E-04	0.4409	0.3524	-0.334E-01

RE(DELTA) = 2900.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5764	0.2241E-03	0.5693E-04	0.5400	0.4123	-0.565E-01
0.600	1.4819	0.2068E-03	0.3955E-04	0.5094	0.4048	-0.394E-01
0.550	1.3798	0.1896E-03	0.2613E-04	0.4787	0.3985	-0.262E-01
0.500	1.2729	0.1724E-03	0.1593E-04	0.4605	0.3928	-0.167E-01
0.450	1.1626	0.1551E-03	0.8827E-05	0.4490	0.3870	-0.988E-02
0.400	1.0502	0.1379E-03	0.4310E-05	0.4417	0.3808	-0.525E-02
0.350	0.9362	0.1206E-03	0.2344E-05	0.4361	0.3738	-0.316E-02
0.300	0.8209	0.1034E-03	0.2517E-05	0.4314	0.3654	-0.383E-02
0.250	0.7044	0.8620E-04	0.4793E-05	0.4260	0.3549	-0.840E-02
0.200	0.5862	0.6896E-04	0.8689E-05	0.4207	0.3411	-0.180E-01

RE(DELTA) = 4740.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.4297	0.1160E-03	0.3881E-04	0.5920	0.3846	-0.761E-01
0.500	1.3426	0.1054E-03	0.2402E-04	0.5208	0.3724	-0.441E-01
0.450	1.2357	0.9493E-04	0.1333E-04	0.4497	0.3641	-0.230E-01
0.400	1.1199	0.8438E-04	0.5949E-05	0.4209	0.3571	-0.106E-01
0.350	0.9980	0.7383E-04	0.1265E-05	0.4070	0.3507	-0.244E-02
0.300	0.8742	0.6329E-04	-0.1012E-05	0.3987	0.3431	0.218E-02
0.250	0.7472	0.5274E-04	-0.1202E-05	0.3924	0.3345	0.299E-02
0.200	0.6194	0.4219E-04	0.4430E-06	0.3861	0.3228	-0.130E-02

NA = 0.0750   XW/U = 0.8000   WT = 1.5708

PROFILE COEFFICIENTS   0.14258   -0.00861   1.03290   1.45390   -16.69000   29.54900   -20.74200   5.26270

RE(DELTA) = 1620.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5129	0.4012E-03	0.3746E-04	0.4955	0.4296	-0.198E-01
0.600	1.4118	0.3703E-03	0.2796E-04	0.4904	0.4249	-0.157E-01
0.550	1.3090	0.3395E-03	0.2104E-04	0.4854	0.4201	-0.126E-01
0.500	1.2058	0.3086E-03	0.1691E-04	0.4826	0.4146	-0.109E-01
0.450	1.1018	0.2777E-03	0.1590E-04	0.4800	0.4084	-0.108E-01
0.400	0.9975	0.2469E-03	0.1611E-04	0.4771	0.4010	-0.124E-01
0.350	0.8922	0.2160E-03	0.1901E-04	0.4730	0.3922	-0.163E-01
0.300	0.7861	0.1851E-03	0.2382E-04	0.4671	0.3816	-0.229E-01
0.250	0.6781	0.1543E-03	0.3030E-04	0.4567	0.3686	-0.330E-01
0.200	0.5671	0.1234E-03	0.3777E-04	0.4463	0.3526	-0.481E-01

RE(DELTA) = 2090.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	A.FAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5621	0.3110E-03	0.3464E-04	0.4832	0.4161	-0.223E-01
0.600	1.4584	0.2870E-03	0.2349E-04	0.4756	0.4114	-0.160E-01
0.550	1.3518	0.2631E-03	0.1483E-04	0.4679	0.4068	-0.107E-01
0.500	1.2447	0.2392E-03	0.9090E-05	0.4638	0.4017	-0.708E-02
0.450	1.1362	0.2153E-03	0.5789E-05	0.4601	0.3960	-0.490E-02
0.400	1.0274	0.1913E-03	0.4976E-05	0.4572	0.3893	-0.462E-02
0.350	0.9175	0.1674E-03	0.6315E-05	0.4537	0.3814	-0.652E-02
0.300	0.8070	0.1435E-03	0.9665E-05	0.4494	0.3717	-0.112E-01
0.250	0.6950	0.1196E-03	0.1468E-04	0.4421	0.3597	-0.195E-01
0.200	0.5808	0.9569E-04	0.2105E-04	0.4347	0.3443	-0.329E-01

RE(DELTA) = 2900.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.6219	0.2241E-03	0.3899E-04	0.4847	0.4007	-0.338E-01
0.600	1.5175	0.2068E-03	0.2537E-04	0.4700	0.3953	-0.227E-01
0.550	1.4091	0.1896E-03	0.1482E-04	0.4554	0.3903	-0.138E-01
0.500	1.2979	0.1724E-03	0.7068E-05	0.4454	0.3852	-0.703E-02
0.450	1.1846	0.1551E-03	0.1862E-05	0.4384	0.3798	-0.199E-02
0.400	1.0698	0.1379E-03	-0.9310E-06	0.4332	0.3739	0.109E-02
0.350	0.9538	0.1206E-03	-0.1551E-05	0.4295	0.3669	0.202E-02
0.300	0.8370	0.1034E-03	-0.1034E-06	0.4259	0.3584	0.152E-03
0.250	0.7190	0.8620E-04	0.3172E-05	0.4207	0.3477	-0.538E-02
0.200	0.5993	0.6896E-04	0.8000E-05	0.4155	0.3337	-0.160E-01

RE(DELTA) = 4740.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.4822	0.1160E-03	0.2381E-04	0.4801	0.3710	-0.365E-01
0.500	1.3760	0.1054E-03	0.1305E-04	0.4520	0.3633	-0.203E-01
0.450	1.2606	0.9493E-04	0.5232E-05	0.4239	0.3569	-0.834E-02
0.400	1.1400	0.8438E-04	-0.2109E-06	0.4082	0.3508	0.358E-03
0.350	1.0156	0.7383E-04	-0.3291E-05	0.3987	0.3446	0.612E-02
0.300	0.8892	0.6329E-04	-0.4388E-05	0.3926	0.3373	0.918E-02
0.250	0.7609	0.5274E-04	-0.3502E-05	0.3879	0.3285	0.846E-02
0.200	0.6314	0.4219E-04	-0.1033E-05	0.3821	0.3167	0.296E-02
0.150	0.4992	0.3164E-04	0.2890E-05	0.3764	0.3004	-0.103E-01

NA = 0.0750 XW/U = 0.8000 WT = 3.1416

PROFILE COEFFICIENTS -0.25717 1.06950 1.86520 -6.07790 5.47710 4.11940 -6.07050 1.89570

RE(DELTA) = 1400.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.3205	0.3928E-03	0.1571E-05	0.4824	0.4165	-0.803E-03
0.500	1.2170	0.3571E-03	-0.1714E-05	0.4807	0.4108	0.948E-03
0.450	1.1125	0.3214E-03	-0.2214E-05	0.4791	0.4044	0.133E-02
0.400	1.0083	0.2857E-03	0.7142E-07	0.4775	0.3967	-0.473E-04

RE(DELTA) = 1620.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5514	0.4012E-03	0.1629E-04	0.4887	0.4189	-0.831E-02
0.600	1.4482	0.3703E-03	0.5740E-05	0.4814	0.4[illegible]	-0.309E-02
0.550	1.3437	0.3395E-03	-0.2037E-05	0.4741	0.4093	0.11[illegible]E-02
0.500	1.2373	0.3086E-03	-0.6543E-05	0.4697	0.4041	0.402E-02
0.450	1.1308	0.2777E-03	-0.8209E-05	0.4677	0.3979	0.550E-02
0.400	1.0235	0.2469E-03	-0.7037E-05	0.4653	0.3908	0.518E-02
0.350	0.9159	0.2160E-03	-0.3333E-05	0.4625	0.3821	0.272E-02
0.300	0.8073	0.1851E-03	0.2777E-05	0.4583	0.3716	-0.255E-02
0.250	0.6977	0.1543E-03	0.1098E-04	0.4513	0.3583	-0.115E-01
0.200	0.[illegible]	0.1234E-03	0.2092E-04	0.4443	0.3414	-0.257E-01

RE(DELTA) = 2090.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5951	0.3110E-03	0.1885E-04	0.4828	0.4074	-0.119E-01
0.600	1.4909	0.2[illegible]E-03	0.6842E-05	0.4722	0.4024	-0.452E-02
0.550	1.3833	0.2631E-03	-0.2679E-05	0.4616	0.3975	0.186E-02
0.500	1.2743	0.2392E-03	-0.8947E-05	0.4556	0.3923	0.668E-02
0.450	1.1638	0.2153E-03	-0.1253E-04	0.4506	0.3866	0.101E-01
0.400	1.0524	0.1913E-03	-0.1330E-04	0.4470	0.3800	0.113E-01
0.350	0.9401	0.1674E-03	-0.1162E-04	0.4440	0.3723	0.114E-01
0.300	0.8272	0.1435E-03	-0.7464E-05	0.4407	0.3626	0.831E-02
0.250	0.7132	0.1196E-03	-0.1196E-05	0.4353	0.3505	0.152E-02
0.200	0.5975	0.9569E-04	0.6937E-05	0.4300	0.3347	-0.104E-01

RE(DELTA) = 2900.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.6383	0.2241E-03	0.2724E-04	0.5118	0.3967	-0.746E-01
0.600	1.5387	0.2068E-03	0.1417E-04	0.4876	0.3899	-0.130E-01
0.550	1.4328	0.1896E-03	0.2862E-05	0.4623	0.3838	-0.267E-02
0.500	1.3223	0.1724E-03	-0.5344E-05	0.4459	0.3781	0.522E-02
0.450	1.2085	0.1551E-03	-0.1103E-04	0.4348	0.3723	0.115E-01
0.400	1.0923	0.1379E-03	-0.1399E-04	0.4273	0.3661	0.150E-01
0.350	0.9745	0.1206E-03	-0.1458E-04	0.4223	0.3591	0.183E-01
0.300	0.8555	0.1034E-03	-0.1279E-04	0.4184	0.3506	0.181E-01
0.250	0.7355	0.8620E-04	-0.8862E-05	0.4140	0.3399	0.144E-01
0.200	0.6140	0.6896E-04	-0.2931E-05	0.4097	0.3257	0.567E-02

RE(DELTA) = 4740.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.5534	0.1265E-03	0.2350E-04	0.6557	0.3862	-0.470E-01
0.550	1.4734	0.1160E-03	0.1432E-04	0.5745	0.3732	-0.264E-01
0.500	1.3780	0.1054E-03	0.5316E-05	0.4933	0.3628	-0.902E-02
0.450	1.2699	0.9493E-04	-0.2172E-05	0.4451	0.3543	0.361E-02
0.400	1.1530	0.8438E-04	-0.7616E-05	0.4176	0.3469	0.130E-01
0.350	1.0303	0.7383E-04	-0.1008E-04	0.4009	0.3397	0.200E-01
0.300	0.9035	0.6329E-04	-0.1196E-04	0.3908	0.3320	0.249E-01
0.250	0.7744	0.5274E-04	-0.1097E-04	0.3841	0.3228	0.257E-01
0.200	0.6432	0.4219E-04	-0.8059E-05	0.3779	0.3109	0.224E-01
0.150	0.5098	0.3164E-04	-0.3438E-05	0.3717	0.2942	0.118E-01

NA = 0.0750   XW/U = 0.8000   WT = 3.9270

PROFILE COEFFICIENTS -0.31553 0.80424 2.93320 -8.30030 2.10170 10.12500 -10.41100 3.08010

RE(DELTA) = 1620.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5473	0.4012E-03	0.1641E-04	0.4922	0.4200	-0.846E-02
0.600	1.4453	0.3703E-03	0.4506E-05	0.4843	0.4151	-0.244E-02
0.550	1.3408	0.3395E-03	-0.4444E-05	0.4764	0.4102	0.255E-02
0.500	1.2354	0.3086E-03	-0.1012E-04	0.4717	0.4047	0.626E-02
0.450	1.1288	0.2777E-03	-0.1265E-04	0.4679	0.3986	0.849E-02
0.400	1.0217	0.2469E-03	-0.1222E-04	0.4651	0.3915	0.901E-02
0.350	0.9138	0.2160E-03	-0.9012E-05	0.4621	0.3830	0.738E-02
0.300	0.8053	0.1851E-03	-0.3148E-05	0.4585	0.3725	0.290E-02
0.250	0.6957	0.1543E-03	0.4999E-05	0.4521	0.3593	-0.526E-02
0.200	0.5841	0.1234E-03	0.1506E-04	0.4457	0.3424	-0.186E-01

RE(DELTA) = 2090.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5859	0.3110E-03	0.2114E-04	0.4986	0.4098	-0.138E-01
0.600	1.4847	0.2870E-03	0.7894E-05	0.4833	0.4041	-0.537E-02
0.550	1.3789	0.2631E-03	-0.2918E-05	0.4679	0.3988	0.207E-02
0.500	1.2710	0.2392E-03	-0.1028E-04	0.4591	0.3933	0.776E-02
0.450	1.1611	0.2153E-03	-0.1483E-04	0.4527	0.3875	0.120E-01
0.400	1.0501	0.1913E-03	-0.1636E-04	0.4480	0.3809	0.145E-01
0.350	0.9379	0.1674E-03	-0.1526E-04	0.4440	0.3731	0.151E-01
0.300	0.8249	0.1435E-03	-0.1153E-04	0.4405	0.3636	0.128E-01
0.250	0.7109	0.1196E-03	-0.5454E-05	0.4359	0.3516	0.699E-02
0.200	0.5955	0.9569E-04	0.2727E-05	0.4313	0.3358	-0.412E-02

RE(DELTA) = 2900.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.6160	0.2241E-03	0.3062E-04	0.5581	0.4022	-0.306E-01
0.600	1.5241	0.2068E-03	0.1658E-04	0.5190	0.3936	-0.163E-01
0.550	1.4229	0.1896E-03	0.4448E-05	0.4800	0.3865	-0.435E-02
0.500	1.3156	0.1724E-03	-0.4724E-05	0.4564	0.3800	0.475E-02
0.450	1.2037	0.1551E-03	-0.1127E-04	0.4408	0.3738	0.119E-01
0.400	1.0887	0.1379E-03	-0.1506E-04	0.4308	0.3674	0.172E-01
0.350	0.9716	0.1206E-03	-0.1634E-04	0.4241	0.3602	0.206E-01
0.300	0.8529	0.1034E-03	-0.1503E-04	0.4189	0.3517	0.214E-01
0.250	0.7329	0.8620E-04	-0.1148E-04	0.4144	0.3411	0.188E-01
0.200	0.6116	0.6896E-04	-0.5689E-05	0.4069	0.3270	0.109E-01
0.150	0.4871	0.5172E-04	0.2103E-05	0.3993	0.3079	-0.500E-02

RE(DELTA) = 4740.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.4448	0.1160E-03	0.1499E-04	0.5985	0.3806	-0.294E-01
0.500	1.3578	0.1054E-03	0.6877E-05	0.5343	0.3682	-0.128E-01
0.450	1.2566	0.9493E-04	-0.9704E-06	0.4702	0.3581	0.172E-02
0.400	1.1446	0.8438E-04	-0.6940E-05	0.4318	0.3494	0.124E-01
0.350	1.0248	0.7383E-04	-0.1086E-04	0.4083	0.3415	0.205E-01
0.300	0.8996	0.6329E-04	-0.1246E-04	0.3945	0.3334	0.259E-01
0.250	0.7713	0.5274E-04	-0.1196E-04	0.3858	0.3241	0.283E-01
0.200	0.6404	0.4219E-04	-0.9324E-05	0.3789	0.3123	0.261E-01
0.150	0.5074	0.3164E-04	-0.4810E-05	0.3697	0.2956	0.166E-01
0.100	0.3699	0.2109E-04	0.1223E-05	0.3606	0.2703	-0.565E-02

NA = 0.0750 XW/U = 0.8000 WT = 4.7124

PROFILE COEFFICIENTS -0.18354 0.00842 3.55720 -3.38980 -13.50000 30.43600 -23.13300 6.22150

RE(DELTA) = 1400.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.500	1.1963	0.3571E-03	0.7142E-07	0.5985	0.4179	-0.900E-04
0.450	1.0937	0.3214E-03	-0.2214E-05	0.4840	0.4114	0.137E-02
0.400	0.9897	0.2857E-03	-0.9285E-06	0.3695	0.4041	0.485E-03

RE(DELTA) = 1620.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5210	0.4012E-03	0.2611E-04	0.5070	0.4273	-0.141E-01
0.600	1.4216	0.3703E-03	0.1345E-04	0.4966	0.4220	-0.761E-02
0.550	1.3196	0.3395E-03	0.3703E-05	0.4851	0.4167	-0.221E-02
0.500	1.2159	0.3086E-03	-0.2962E-05	0.4800	0.4112	0.189E-02
0.450	1.1113	0.2777E-03	-0.6358E-05	0.4757	0.4049	0.440E-02
0.400	1.0057	0.2469E-03	-0.6790E-05	0.4719	0.3977	0.516E-02
0.350	0.8994	0.2160E-03	-0.4320E-05	0.4686	0.3891	0.364E-02
0.300	0.7923	0.1851E-03	0.6172E-06	0.4642	0.3786	-0.585E-03
0.250	0.6840	0.1543E-03	0.7962E-05	0.4572	0.3654	-0.862E-02
0.200	0.5736	0.1234E-03	0.1716E-04	0.4503	0.3486	-0.218E-01

RE(DELTA) = 2090.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5566	0.3110E-03	0.3095E-04	0.5169	0.4175	-0.214E-01
0.600	1.4587	0.2870E-03	0.1688E-04	0.4987	0.4113	-0.120E-01
0.550	1.3560	0.2631E-03	0.5071E-05	0.4806	0.4056	-0.375E-02
0.500	1.2506	0.2392E-03	-0.3205E-05	0.4695	0.3998	0.251E-02
0.450	1.1430	0.2153E-03	-0.8612E-05	0.4612	0.3937	0.726E-02
0.400	1.0338	0.1913E-03	-0.1086E-04	0.4551	0.3869	0.999E-02
0.350	0.9233	0.1674E-03	-0.1057E-04	0.4506	0.3790	0.107E-01
0.300	0.8119	0.1435E-03	-0.7559E-05	0.4464	0.3695	0.868E-02
0.250	0.6993	0.1196E-03	-0.2344E-05	0.4411	0.3575	0.309E-02
0.200	0.5852	0.9569E-04	0.5071E-05	0.4358	0.3417	-0.789E-02

RE(DELTA) = 2900.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.4928	0.2068E-03	0.2513E-04	0.5330	0.4019	-0.260E-01
0.550	1.3970	0.1896E-03	0.1220E-04	0.5020	0.3937	-0.127E-01
0.500	1.2933	0.1724E-03	0.2103E-05	0.4710	0.3866	-0.222E-02
0.450	1.1846	0.1551E-03	-0.5275E-05	0.4518	0.3798	0.583E-02
0.400	1.0719	0.1379E-03	-0.9896E-05	0.4392	0.3731	0.117E-01
0.350	0.9569	0.1206E-03	-0.1186E-04	0.4310	0.3657	0.154E-01
0.300	0.8399	0.1034E-03	-0.1131E-04	0.4250	0.3571	0.165E-01
0.250	0.7216	0.8620E-04	-0.8379E-05	0.4196	0.3464	0.141E-01
0.200	0.6016	0.6896E-04	-0.3275E-05	0.4143	0.3324	0.654E-02

RE(DELTA) = 4740.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.4045	0.1160E-03	0.2101E-04	0.6828	0.3915	-0.484E-01
0.500	1.3274	0.1054E-03	0.1301E-04	0.5916	0.3766	-0.275E-01
0.450	1.2339	0.9493E-04	0.4472E-05	0.5003	0.3646	-0.859E-02
0.400	1.1266	0.8438E-04	-0.2278E-05	0.4475	0.3550	0.429E-02
0.350	1.0101	0.7383E-04	-0.6983E-05	0.4176	0.3465	0.136E-01
0.300	0.8870	0.6329E-04	-0.9240E-05	0.4008	0.3382	0.197E-01
0.250	0.7606	0.5274E-04	-0.9303E-05	0.3908	0.3286	0.226E-01
0.200	0.6311	0.4219E-04	-0.7194E-05	0.3831	0.3169	0.207E-01
0.150	0.4996	0.3164E-04	-0.3206E-05	0.3733	0.3002	0.113E-01
0.100	0.3632	0.2109E-04	0.2320E-05	0.3636	0.2753	-0.110E-01

NA = 0.0750   XW/U = 0.8000   WT = 5.4978

PROFILE COEFFICIENTS 0.05326 -0.79164 3.56690 1.81000 -26.90500 46.39400 -32.53700 8.42630

RE(DELTA) = 1620.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.4938	0.4012E-03	0.4092E-04	0.5171	0.4351	-0.229E-01
0.600	1.3962	0.3703E-03	0.2802E-04	0.5056	0.4297	-0.164E-01
0.550	1.2960	0.3395E-03	0.1814E-04	0.4941	0.4243	-0.112E-01
0.500	1.1938	0.3086E-03	0.1129E-04	0.4878	0.4188	-0.747E-02
0.450	1.0910	0.2777E-03	0.7592E-05	0.4838	0.4124	-0.545E-02
0.400	0.9871	0.2469E-03	0.6666E-05	0.4798	0.4052	-0.525E-02
0.350	0.8826	0.2160E-03	0.8333E-05	0.4757	0.3965	-0.727E-02
0.300	0.7769	0.1851E-03	0.1240E-04	0.4706	0.3861	-0.121E-01
0.250	0.6701	0.1543E-03	0.1851E-04	0.4626	0.3730	-0.207E-01
0.200	0.5607	0.1234E-03	0.2623E-04	0.4546	0.3566	-0.344E-01

RE(DELTA) = 2090.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5324	0.3110E-03	0.4354E-04	0.5195	0.4241	-0.308E-01
0.600	1.4350	0.2870E-03	0.2861E-04	0.5032	0.4181	-0.209E-01
0.550	1.3336	0.2631E-03	0.1698E-04	0.4869	0.4124	-0.129E-01
0.500	1.2296	0.2392E-03	0.8468E-05	0.4757	0.4066	-0.684E-02
0.450	1.1234	0.2153E-03	0.2918E-05	0.4677	0.4005	-0.259E-02
0.400	1.0158	0.1913E-03	0.9569E-07	0.4619	0.3937	-0.909E-04
0.350	0.9069	0.1674E-03	-0.4784E-07	0.4572	0.3859	0.504E-04
0.300	0.7971	0.1435E-03	0.2200E-05	0.4527	0.3763	-0.261E-02
0.250	0.6860	0.1196E-03	0.6650E-05	0.4464	0.3644	-0.904E-02
0.200	0.5731	0.9569E-04	0.1287E-04	0.4402	0.3489	-0.206E-01

RE(DELTA) = 2900.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5598	0.2241E-03	0.5262E-04	0.6098	0.4167	-0.596E-01
0.600	1.4753	0.2068E-03	0.3582E-04	0.5557	0.4066	-0.391E-01
0.550	1.3791	0.1896E-03	0.2203E-04	0.5016	0.3988	-0.232E-01
0.500	1.2757	0.1724E-03	0.1124E-04	0.4719	0.3919	-0.120E-01
0.450	1.1671	0.1551E-03	0.3482E-05	0.4546	0.3855	-0.393E-02
0.400	1.0557	0.1379E-03	-0.1448E-05	0.4437	0.3788	0.176E-02
0.350	0.9417	0.1206E-03	-0.3793E-05	0.4357	0.3716	0.508E-02
0.300	0.8262	0.1034E-03	-0.3689E-05	0.4301	0.3631	0.557E-02
0.250	0.7092	0.8620E-04	-0.1344E-05	0.4246	0.3525	0.233E-02
0.200	0.5907	0.6896E-04	0.2965E-05	0.4191	0.3385	-0.610E-02

RE(DELTA) = 4740.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.3879	0.1160E-03	0.3234E-04	0.7568	0.3962	-0.835E-01
0.500	1.318[illegible]	0.1054E-03	0.2156E-04	0.6283	0.3793	-0.487E-01
0.450	1.2255	0.9493E-04	0.1130E-04	0.4998	0.3671	-0.218E-01
0.400	1.1169	0.8438E-04	0.3502E-05	0.4426	0.3581	-0.657E-02
0.350	0.9992	0.7383E-04	-0.1708E-05	0.4156	0.3502	0.336E-02
0.300	0.8762	0.6329E-04	-0.4282E-05	0.4018	0.3423	0.930E-02
0.250	0.7503	0.5274E-04	-0.4683E-05	0.3932	0.3332	0.116E-01
0.200	0.6219	0.4219E-04	-0.2953E-05	0.3861	0.3215	0.869E-02
0.150	0.4913	0.3164E-04	0.4430E-06	0.[illegible]56	0.3053	-0.160E-02
0.100	0.3556	0.2109E-04	0.5147E-05	0.3651	0.2812	-0.250E-01

NA = 0.0750   XW/U = 1.4000   WT = 0.0000

PROFILE COEFFICIENTS   0.30180   -1.88970   6.39270   -4.42310   -16.31700   34.88700   -25.65300   6.71900

RE(DELTA) = 2140.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5209	0.3037E-03	0.5453E-04	0.5122	0.4273	-0.393E-01
0.600	1.4233	0.2803E-03	0.3971E-04	0.4969	0.4215	-0.296E-01
0.550	1.3195	0.2570E-03	0.2757E-04	0.4816	0.4168	-0.215E-01
0.500	1.2157	0.2336E-03	0.1906E-04	0.4747	0.4112	-0.159E-01
0.450	1.1088	0.2102E-03	0.1317E-04	0.4679	0.4058	-0.119E-01
0.400	1.0020	0.1869E-03	0.1018E-04	0.4628	0.3992	-0.100E-01
0.350	0.8927	0.1635E-03	0.9439E-05	0.4578	0.3920	-0.103E-01
0.300	0.7836	0.1401E-03	0.1098E-04	0.4529	0.3828	-0.135E-01
0.250	0.6719	0.1168E-03	0.1448E-04	0.4456	0.3720	-0.205E-01
0.200	0.5592	0.9345E-04	0.1939E-04	0.4383	0.3576	-0.325E-01

RE(DELTA) = 2760.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5562	0.2355E-03	0.6054E-04	0.5431	0.4176	-0.583E-01
0.600	1.4622	0.2173E-03	0.4282E-04	0.5129	0.4103	-0.414E-01
0.550	1.3610	0.1992E-03	0.2916E-04	0.4828	0.4041	-0.289E-01
0.500	1.2550	0.1811E-03	0.1858E-04	0.4645	0.3984	-0.189E-01
0.450	1.1457	0.1630E-03	0.1126E-04	0.4531	0.3927	-0.123E-01
0.400	1.0343	0.1449E-03	0.6485E-05	0.4456	0.3867	-0.771E-02
0.350	0.9213	0.1268E-03	0.4347E-05	0.4397	0.3798	-0.572E-02
0.300	0.8069	0.1086E-03	0.4347E-05	0.4346	0.3717	-0.646E-02
0.250	0.6912	0.9057E-04	0.6485E-05	0.4286	0.3616	-0.111E-01
0.200	0.5736	0.7246E-04	0.1018E-04	0.4227	0.3486	-0.207E-01

RE(DELTA) = 3820.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.4873	0.1570E-03	0.5353E-04	0.6219	0.4034	-0.835E-01
0.550	1.4043	0.1439E-03	0.3591E-04	0.5492	0.3916	-0.536E-01
0.500	1.3035	0.1308E-03	0.2267E-04	0.4765	0.3835	-0.316E-01
0.450	1.1941	0.1178E-03	0.1301E-04	0.4451	0.3768	-0.185E-01
0.400	1.0787	0.1047E-03	0.6361E-05	0.4290	0.3708	-0.966E-02
0.350	0.9610	0.9162E-04	0.2356E-05	0.4197	0.3642	-0.393E-02
0.300	0.8404	0.7853E-04	0.7068E-06	0.4125	0.3569	-0.132E-02
0.250	0.7185	0.6544E-04	0.1125E-05	0.4065	0.3478	-0.243E-02
0.200	0.5944	0.5235E-04	0.3403E-05	0.4005	0.3364	-0.875E-02

RE(DELTA) = 6250.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.3163	0.8785E-04	0.3611E-04	3.0512	0.4178	-0.524E 00
0.500	1.2983	0.7987E-04	0.3535E-04	1.9043	0.3851	-0.324E 00
0.450	1.2498	0.7188E-04	0.2186E-04	0.7574	0.3600	-0.829E-01
0.400	1.1465	0.6389E-04	0.1140E-04	0.4500	0.3488	-0.280E-01
0.350	1.0263	0.5591E-04	0.4760E-05	0.4040	0.3410	-0.117E-01
0.300	0.8988	0.4792E-04	0.7507E-06	0.3851	0.3337	-0.201E-02
0.250	0.7666	0.3993E-04	-0.9105E-06	0.3752	0.3261	0.279E-02
0.200	0.6323	0.3194E-04	-0.7827E-06	0.3653	0.3163	0.283E-02

NA = 0.0750   XW/U = 1.4000   WT = 1.5708

PROFILE COEFFICIENTS   0.20860   0.01208   -0.04456   3.24110   -16.31500   26.78400   -18.67000   4.80090

RE(DELTA) = 2140.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5783	0.3037E-03	0.4373E-04	0.4694	0.4118	-0.278E-01
0.600	1.4717	0.2803E-03	0.3205E-04	0.4634	0.4076	-0.216E-01
0.550	1.3625	0.2570E-03	0.2303E-04	0.4574	0.4036	-0.165E-01
0.500	1.2531	0.2336E-03	0.1677E-04	0.4551	0.3990	-0.130E-01
0.450	1.1428	0.2102E-03	0.1303E-04	0.4528	0.3937	-0.110E-01
0.400	1.0323	0.1869E-03	0.1163E-04	0.4508	0.3874	-0.108E-01
0.350	0.9210	0.1635E-03	0.1242E-04	0.4482	0.3800	-0.129E-01
0.300	0.8092	0.1401E-03	0.1509E-04	0.4444	0.3707	-0.177E-01
0.250	0.6960	0.1168E-03	0.1943E-04	0.4374	0.3[illegible]91	-0.261E-01
0.200	0.5806	0.9345E-04	0.2500E-04	0.4305	0.3444	-0.396E-01

RE(DELTA) = 2760.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.6333	0.2395E-03	0.4413E-04	0.4609	0.3979	-0.343E-01
0.600	1.5246	0.2173E-03	0.3112E-04	0.4510	0.3935	-0.254E-01
0.550	1.4115	0.1992E-03	0.2047E-04	0.4411	0.3896	-0.176E-01
0.500	1.2979	0.1811E-03	0.1278E-04	0.4370	0.3852	-0.118E-01
0.450	1.1827	0.1630E-03	0.7644E-05	0.4336	0.3804	-0.773E-02
0.400	1.0673	0.1449E-03	0.4963E-05	0.4310	0.3747	-0.553E-02
0.350	0.9507	0.1268E-03	0.4347E-05	0.4284	0.3681	-0.540E-02
0.300	0.8339	0.1086E-03	0.5760E-05	0.4257	0.3597	-0.811E-02
0.250	0.7158	0.9057E-04	0.8913E-05	0.4208	0.3492	-0.144E-01
0.200	0.5963	0.7246E-04	0.1347E-04	0.4160	0.3354	-0.259E-01

RE(DELTA) = 3820.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.5879	0.1570E-03	0.3541E-04	0.4474	0.3778	-0.381E-01
0.550	1.4749	0.1439E-03	0.2269E-04	0.4345	0.3729	-0.255E-01
0.500	1.3577	0.1308E-03	0.1324E-04	0.4216	0.3682	-0.157E-01
0.450	1.2377	0.1178E-03	0.6361E-05	0.4134	0.3635	-0.811E-02
0.400	1.1158	0.1047E-03	0.2041E-05	0.4081	0.3584	-0.285E-02
0.350	0.9927	0.9162E-04	-0.1570E-06	0.4046	0.3525	0.244E-03
0.300	0.8687	0.7853E-04	-0.2617E-06	0.4019	0.3453	0.462E-03
0.250	0.7439	0.6544E-04	0.1361E-05	0.3985	0.3360	-0.278E-02
0.200	0.6178	0.5235E-04	0.4607E-05	0.3952	0.3237	-0.112E-01

RE(DELTA) = 6260.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.5359	0.8785E-04	0.3455E-04	0.5305	0.3580	-0.747E-01
0.500	1.4393	0.7987E-04	0.2065E-04	0.4703	0.3473	-0.422E-01
0.450	1.3211	0.7188E-04	0.1099E-04	0.4100	0.3406	-0.213E-01
0.400	1.1952	0.6389E-04	0.4232E-05	0.3875	0.3346	-0.859E-02
0.350	1.0629	0.5591E-04	-0.3194E-07	0.3760	0.3292	0.707E-04
0.300	0.9293	0.4792E-04	-0.2268E-05	0.3698	0.3228	0.565E-02
0.250	0.7925	0.3993E-04	-0.2603E-05	0.3652	0.3194	0.751E-02
0.200	0.6555	0.3194E-04	-0.1357E-05	0.3605	0.3051	0.467E-02

NA = 0.0750 XW/U = 1.4000 WT = 3.1416

PROFILE COEFFICIENTS -0.32038 1.88970 -1.83430 1.83850 -11.48900 21.64800 -15.88000 4.15970

RE(DELTA) = 1300.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.3168	0.4230E-03	0.1769E-05	0.5305	0.4176	-0.926E-03
0.500	1.2150	0.3846E-03	-0.4615E-06	0.4880	0.4115	0.241E-03
0.450	1.1119	0.3461E-03	0.2307E-06	0.4455	0.4047	-0.120E-03

RE(DELTA) = 1700.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5684	0.3823E-03	0.1211E-04	0.4828	0.4144	-0.634E-02
0.600	1.4646	0.3529E-03	0.1823E-05	0.4769	0.4096	-0.100E-02
0.550	1.3587	0.3235E-03	-0.5588E-05	0.4710	0.4047	0.329E-02
0.500	1.2523	0.2941E-03	-0.1005E-04	0.4677	0.3992	0.638E-02
0.450	1.1449	0.2647E-03	-0.1152E-04	0.4646	0.3930	0.795E-02
0.400	1.0371	0.2352E-03	-0.1029E-04	0.4625	0.3856	0.780E-02
0.350	0.9287	0.2058E-03	-0.6529E-05	0.4601	0.3768	0.550E-02
0.300	0.8198	0.1764E-03	-0.3529E-06	0.4564	0.3659	0.334E-03
0.250	0.7096	0.1470E-03	0.7882E-05	0.4496	0.3523	-0.849E-02
0.200	0.5974	0.1176E-03	0.1776E-04	0.4363	0.3347	-0.220E-01
0.150	0.4803	0.8823E-04	0.2882E-04	0.4229	0.3123	-0.431E-01

RE(DELTA) = 2140.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.6083	0.3037E-03	0.1523E-04	0.4805	0.4041	-0.973E-02
0.600	1.5036	0.2803E-03	0.3644E-05	0.4700	0.3990	-0.243E-02
0.550	1.3955	0.2570E-03	-0.5514E-05	0.4595	0.3941	0.388E-02
0.500	1.2860	0.2336E-03	-0.1149E-04	0.4537	0.3888	0.867E-02
0.450	1.1751	0.2102E-03	-0.1476E-04	0.4492	0.3829	0.120E-01
0.400	1.0634	0.1869E-03	-0.1523E-04	0.4458	0.3761	0.136E-01
0.350	0.9508	0.1635E-03	-0.1331E-04	0.4428	0.3681	0.132E-01
0.300	0.8376	0.1401E-03	-0.8925E-05	0.4399	0.3581	0.100E-01
0.250	0.7235	0.1168E-03	-0.2476E-05	0.4353	0.3455	0.318E-02
0.200	0.6079	0.9345E-04	0.5887E-05	0.4307	0.3290	-0.892E-02

RE(DELTA) = 2760.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.6447	0.2355E-03	0.2217E-04	0.4975	0.3952	-0.185E-01
0.600	1.5428	0.2173E-03	0.9347E-05	0.4772	0.3889	-0.798E-02
0.550	1.4350	0.1992E-03	-0.1268E-05	0.4569	0.3832	0.111E-02
0.500	1.3239	0.1811E-03	-0.8804E-05	0.4445	0.3776	0.815E-02
0.450	1.2100	0.1630E-03	-0.1373E-04	0.4355	0.3719	0.136E-01
0.400	1.0943	0.1449E-03	-0.1597E-04	0.4297	0.3655	0.173E-01
0.350	0.9773	0.1268E-03	-0.1586E-04	0.4255	0.3581	0.190E-01
0.300	0.8593	0.1086E-03	-0.1336E-04	0.4223	0.3491	0.181E-01
0.250	0.7405	0.9057E-04	-0.8731E-05	0.4185	0.3376	0.136E-01
0.200	0.6204	0.7246E-04	-0.2137E-05	0.4148	0.3223	0.394E-02

RE(DELTA) = 3820.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.5745	0.1570E-03	0.1790E-04	0.5216	0.3810	-0.226E-01
0.550	1.4762	0.1439E-03	0.7120E-05	0.4862	0.3725	-0.895E-02
0.500	1.3684	0.1308E-03	-0.2015E-05	0.4508	0.3653	0.253E-02
0.450	1.2542	0.1178E-03	-0.8560E-05	0.4293	0.3587	0.111E-01
0.400	1.1354	0.1047E-03	-0.1277E-04	0.4158	0.3522	0.178E-01
0.350	1.0137	0.9162E-04	-0.1458E-04	0.4073	0.3452	0.223E-01
0.300	0.8899	0.7853E-04	-0.1421F-04	0.4016	0.3371	0.245E-01
0.250	0.7647	0.6544E-04	-0.1167E-04	0.3973	0.3269	0.231E-01
0.200	0.6382	0.5235E-04	-0.7251E-05	0.3929	0.3133	0.170E-01

RE(DELTA) = 6260.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.5481	0.9584E-04	0.1849E-04	0.7553	0.3875	-0.565E-01
0.550	1.4772	0.8785E-04	0.1389E-04	0.6651	0.3723	-0.391E-01
0.500	1.3972	0.7987E-04	0.7811E-05	0.5748	0.3578	-0.201E-01
0.450	1.3019	0.7188E-04	0.1246E-05	0.4885	0.3456	-0.292E-02
0.400	1.1914	0.6389E-04	-0.4392E-05	0.4314	0.3357	0.995E-02
0.350	1.0696	0.5591E-04	-0.8354E-05	0.3990	0.3272	0.195E-01
0.300	0.9406	0.4792E-04	-0.1038E-04	0.3807	0.3189	0.263E-01
0.250	0.8069	0.3993E-04	-0.1046E-04	0.3700	0.3098	0.300E-01
0.200	0.6703	0.3194E-04	-0.8690E-05	0.3592	0.2983	0.291E-01

NA = 0.0750 XW/U = 1.4000 WT = 3.9270

PROFILE COEFFICIENTS -0.41623 1.40110 1.02120 -2.18560 -11.34300 26.14900 -19.88200 5.27380

RE(DELTA) = 1200.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5040	0.5416E-03	0.9166E-06	0.5055	0.4321	-0.369E-03
0.600	1.4049	0.4999E-03	-0.7499E-05	0.5015	0.4270	0.321E-02
0.550	1.3046	0.4583E-03	-0.1283E-04	0.4975	0.4215	0.587E-02
0.500	1.2039	0.4166E-03	-0.1466E-04	0.4948	0.4153	0.723E-02
0.450	1.1025	0.3750E-03	-0.1341E-04	0.4923	0.4081	0.719E-02
0.400	1.0008	0.3333E-03	-0.9083E-05	0.4899	0.3996	0.533E-02
0.350	0.8984	0.2916E-03	-0.1916E-05	0.4863	0.3895	0.124E-02
0.300	0.7952	0.2499E-03	0.7833E-05	0.4810	0.3772	-0.568E-02
0.250	0.6905	0.2083E-03	0.1975E-04	0.4715	0.3620	-0.161E-01
0.200	0.5831	0.1666E-03	0.3350E-04	0.4536	0.3429	-0.312E-01
0.150	0.4699	0.1249E-03	0.4858E-04	0.4356	0.3192	-0.540E-01

RE(DELTA) = 1600.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5497	0.4062E-03	0.1062E-05	0.5009	0.4194	-0.549E-03
0.600	1.4485	0.3749E-03	-0.9437E-05	0.4907	0.4142	0.511E-02
0.550	1.3459	0.3437E-03	-0.1737E-04	0.4804	0.4086	0.992E-02
0.500	1.2403	0.3125E-03	-0.2156E-04	0.4737	0.4031	0.131E-01
0.450	1.1348	0.2812E-03	-0.2293E-04	0.4712	0.3965	0.152E-01
0.400	1.0281	0.2500E-03	-0.2131E-04	0.4683	0.3890	0.155E-01
0.350	0.9213	0.2187E-03	-0.1706E-04	0.4655	0.3798	0.137E-01
0.300	0.8133	0.1874E-03	-0.1006E-04	0.4614	0.3688	0.913E-02
0.250	0.7046	0.1562E-03	-0.8124E-06	0.4554	0.3548	0.840E-03
0.200	0.5937	0.1250E-03	0.1049E-04	0.4426	0.3368	-0.125E-01
0.150	0.4786	0.9374E-04	0.2306E-04	0.4298	0.3134	-0.331E-01

RE(DELTA) = 2140.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5903	0.3037E-03	0.8691E-05	0.5067	0.4087	-0.592E-02
0.600	1.4903	0.2803E-03	-0.3084E-05	0.4896	0.4026	0.216E-02
0.550	1.3860	0.2570E-03	-0.1271E-04	0.4726	0.3968	0.927E-02
0.500	1.2787	0.2336E-03	-0.1939E-04	0.4619	0.3910	0.149E-01
0.450	1.1695	0.2102E-03	-0.2313E-04	0.4547	0.3847	0.192E-01
0.400	1.0588	0.1869E-03	-0.2401E-04	0.4494	0.3777	0.218E-01
0.350	0.9470	0.1635E-03	-0.2228E-04	0.4452	0.3695	0.224E-01
0.300	0.8342	0.1401E-03	-0.1794E-04	0.4415	0.3596	0.203E-01
0.250	0.7205	0.1168E-03	-0.1121E-04	0.4368	0.3469	0.145E-01
0.200	0.6053	0.9345E-04	-0.2429E-05	0.4281	0.3304	0.367E-02
0.150	0.4869	0.7009E-04	0.7943E-05	0.4194	0.3080	-0.146E-01

RE(DELTA) = 2760.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.6132	0.2355E-03	0.1724E-04	0.5434	0.4029	-0.160E-01
0.600	1.5191	0.2173E-03	0.4999E-05	0.5124	0.3949	-0.465E-02
0.550	1.4178	0.1992E-03	-0.5652E-05	0.4815	0.3879	0.529E-02
0.500	1.3113	0.1811E-03	-0.1358E-04	0.4607	0.3813	0.131E-01
0.450	1.2007	0.1630E-03	-0.1902E-04	0.4461	0.3747	0.195E-01
0.400	1.0871	0.1449E-03	-0.2173E-04	0.4365	0.3679	0.240E-01
0.350	0.9716	0.1268E-03	-0.2195E-04	0.4299	0.3602	0.268E-01
0.300	0.8545	0.1086E-03	-0.1967E-04	0.4249	0.3510	0.270E-01
0.250	0.7363	0.9057E-04	-0.1510E-04	0.4205	0.3395	0.238E-01
0.200	0.6167	0.7246E-04	-0.8297E-05	0.4137	0.3243	0.153E-01
0.150	0.4946	0.5434E-04	0.2173E-06	0.4070	0.3032	-0.493E-03

RE(DELTA) = 3820.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.5317	0.1570E-03	0.1301E-04	0.5871	0.3917	-0.190E-01
0.550	1.4435	0.1439E-03	0.3979E-05	0.5362	0.3810	-0.564E-02
0.500	1.3446	0.1308E-03	-0.4581E-05	0.4853	0.3718	0.631E-02
0.450	1.2371	0.1178E-03	-0.1120E-04	0.4522	0.3637	0.156E-01
0.400	1.1233	0.1047E-03	-0.1578E-04	0.4304	0.3560	0.231E-01
0.350	1.0047	0.9162E-04	-0.1801E-04	0.4162	0.3483	0.285E-01
0.300	0.8830	0.7853E-04	-0.1798E-04	0.4070	0.3397	0.316E-01
0.250	0.7590	0.6544E-04	-0.1570E-04	0.4006	0.3293	0.316E-01
0.200	0.6334	0.5235E-04	-0.1128E-04	0.3945	0.3157	0.268E-01
0.150	0.5055	0.3926E-04	-0.4947E-05	0.3883	0.2967	0.145E-01

NA = 0.0750 XW/U = 1.4000 WT = 3.9270

RE(DELTA) = 5000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5951	0.1300E-03	0.1822E-04	0.7001	0.4074	-0.399E-01
0.600	1.5204	0.1199E-03	0.1354E-04	0.6551	0.3946	-0.291E-01
0.550	1.4424	0.1099E-03	0.7939E-05	0.6101	0.3813	-0.167E-01
0.500	1.3561	0.1000E-03	0.1519E-05	0.5453	0.3687	-0.305E-02
0.450	1.2583	0.9000E-04	-0.4780E-05	0.4847	0.3576	0.920E-02
0.400	1.1492	0.7999E-04	-0.9979E-05	0.4417	0.3480	0.191E-01
0.350	1.0316	0.6999E-04	-0.1341E-04	0.4145	0.3392	0.269E-01
0.300	0.9078	0.5999E-04	-0.1483E-04	0.3974	0.3304	0.324E-01
0.250	0.7799	0.5000E-04	-0.1415E-04	0.3867	0.3205	0.351E-01
0.200	0.6492	0.3999E-04	-0.1142E-04	0.3789	0.3080	0.333E-01
0.150	0.5160	0.2999E-04	-0.6779E-05	0.3699	0.2906	0.243E-01
0.100	0.3788	0.1999E-04	-0.5599E-06	0.3608	0.2639	0.266E-02

RE(DELTA) = 6260.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5905	0.1038E-03	0.1397E-04	0.6443	0.4086	-0.354E-01
0.600	1.5119	0.9584E-04	0.1092E-04	0.6349	0.3968	-0.287E-01
0.550	1.4330	0.8785E-04	0.7667E-05	0.6254	0.3838	-0.209E-01
0.500	1.3520	0.7987E-04	0.3801E-05	0.5927	0.3698	-0.104E-01
0.450	1.2640	0.7188E-04	-0.8146E-06	0.5338	0.3560	0.215E-02
0.400	1.1639	0.6389E-04	-0.5575E-05	0.4711	0.3436	0.141E-01
0.350	1.0510	0.5591E-04	-0.9440E-05	0.4246	0.3330	0.238E-01
0.300	0.9280	0.4792E-04	-0.1172E-04	0.3957	0.3232	0.312E-01
0.250	0.7981	0.3993E-04	-0.1214E-04	0.3783	0.3132	0.360E-01
0.200	0.6636	0.3194E-04	-0.1062E-04	0.3674	0.3013	0.368E-01
0.150	0.5259	0.2396E-04	-0.7204E-05	0.3582	0.2852	0.307E-01
0.100	0.3844	0.1597E-04	-0.2140E-05	0.3490	0.2601	0.121E-01

NA = 0.0750   XW/U = 1.4000   WT = 4.7124

PROFILE COEFFICIENTS -0.26322 -0.01375 4.97600 -6.43120 -11.62500 30.85700 -23.83900 6.35710

RE(DELTA) = 1200.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.4763	0.5416E-03	0.5666E-05	0.5180	0.4402	-0.238E-02
0.600	1.3794	0.4999E-03	-0.3416E-05	0.5120	0.4349	0.152E-02
0.550	1.2810	0.4583E-03	-0.9499E-05	0.5060	0.4293	0.450E-02
0.500	1.1818	0.4166E-03	-0.1216E-04	0.5022	0.4230	0.620E-02
0.450	1.0819	0.3750E-03	-0.1166E-04	0.4990	0.4159	0.645E-02
0.400	0.9814	0.3333E-03	-0.8083E-05	0.4955	0.4075	0.489E-02
0.350	0.8801	0.2915E-03	-0.1749E-05	0.4914	0.3976	0.117E-02
0.300	0.7779	0.2499E-03	0.7166E-05	0.4856	0.3856	-0.536E-02
0.250	0.6742	0.2083E-03	0.1833E-04	0.4760	0.3708	-0.155E-01
0.200	0.5678	0.1666E-03	0.3133E-04	0.4583	0.3522	-0.303E-01
0.150	0.4559	0.1249E-03	0.4566E-04	0.4407	0.3290	-0.529E-01

RE(DELTA) = 1600.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5180	0.4062E-03	0.7249E-05	0.5170	0.4281	-0.395E-02
0.600	1.4196	0.3749E-03	-0.3749E-05	0.5045	0.4226	0.213E-02
0.550	1.3198	0.3437E-03	-0.1250E-04	0.4920	0.4167	0.745E-02
0.500	1.2163	0.3125E-03	-0.1737E-04	0.4830	0.4110	0.110E-01
0.450	1.1128	0.2812E-03	-0.1962E-04	0.4791	0.4043	0.135E-01
0.400	1.0076	0.2500E-03	-0.1875E-04	0.4750	0.3969	0.141E-01
0.350	0.9023	0.2187E-03	-0.1525E-04	0.4714	0.3878	0.127E-01
0.300	0.7955	0.1874E-03	-0.9062E-05	0.4666	0.3771	0.850E-02
0.250	0.6880	0.1562E-03	-0.5625E-06	0.4598	0.3633	0.601E-03
0.200	0.5780	0.1250E-03	0.9999E-05	0.4469	0.3460	-0.123E-01
0.150	0.4642	0.9374E-04	0.2181E-04	0.4340	0.3231	-0.326E-01

RE(DELTA) = 2140.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5514	0.3037E-03	0.1551E-04	0.5367	0.4189	-0.114E-01
0.600	1.4563	0.2803E-03	0.3271E-05	0.5133	0.4120	-0.246E-02
0.550	1.3565	0.2570E-03	-0.7056E-05	0.4899	0.4054	0.545E-02
0.500	1.2521	0.2336E-03	-0.1439E-04	0.4746	0.3993	0.116E-01
0.450	1.1458	0.2102E-03	-0.1887E-04	0.4651	0.3927	0.164E-01
0.400	1.0371	0.1869E-03	-0.2056E-04	0.4576	0.3856	0.194E-01
0.350	0.9273	0.1635E-03	-0.1953E-04	0.4523	0.3774	0.203E-01
0.300	0.8160	0.1401E-03	-0.1598E-04	0.4472	0.3676	0.187E-01
0.250	0.7037	0.1168E-03	-0.9999E-05	0.4417	0.3552	0.134E-01
0.200	0.5896	0.9345E-04	-0.1915E-05	0.4362	0.3392	0.303E-02

RE(DELTA) = 2760.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5643	0.2355E-03	0.2282E-04	0.5979	0.4155	-0.240E-01
0.600	1.4781	0.2173E-03	0.1097E-04	0.5534	0.4059	-0.113E-01
0.550	1.3832	0.1992E-03	0.1086E-06	0.5090	0.3976	-0.110E-03
0.500	1.2814	0.1811E-03	-0.8333E-05	0.4798	0.3901	0.861E-02
0.450	1.1747	0.1630E-03	-0.1442E-04	0.4603	0.3830	0.155E-01
0.400	1.0641	0.1449E-03	-0.1786E-04	0.4472	0.3759	0.207E-01
0.350	0.9511	0.1268E-03	-0.1880E-04	0.4382	0.3679	0.239E-01
0.300	0.8359	0.1086E-03	-0.1724E-04	0.4314	0.3588	0.245E-01
0.250	0.7193	0.9057E-04	-0.1336E-04	0.4257	0.3475	0.218E-01
0.200	0.6010	0.7246E-04	-0.7246E-05	0.4181	0.3327	0.139E-01
0.150	0.4801	0.5434E-04	0.6159E-06	0.4104	0.3124	-0.145E-02

RE(DELTA) = 3820.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.4795	0.1570E-03	0.1672E-04	0.6472	0.4055	-0.279E-01
0.550	1.3988	0.1439E-03	0.8717E-05	0.5845	0.3931	-0.139E-01
0.500	1.3078	0.1308E-03	0.3403E-06	0.5217	0.3823	-0.518E-03
0.450	1.2066	0.1178E-03	-0.6623E-05	0.4766	0.37[illegible]	0.999E-02
0.400	1.0977	0.1047E-03	-0.1178E-04	0.4467	0.3643	0.183E-01
0.350	0.9826	0.9162E-04	-0.1465E-04	0.4276	0.3561	0.243E-01
0.300	0.8638	0.7853E-04	-0.1531E-04	0.4153	0.3473	0.281E-01
0.250	0.7418	0.6544E-04	-0.1366E-04	0.4065	0.3370	0.286E-01
0.200	0.6178	0.5235E-04	-0.9895E-05	0.3990	0.3237	0.244E-01
0.150	0.4912	0.3926E-04	-0.4162E-05	0.3874	0.3053	0.125E-01
0.100	0.3596	0.2617E-04	0.2905E-05	0.3556	0.2780	-0.109E-01
0.050	0.2087	0.1308E-04	0.1018E-04	0.3238	0.2395	-0.603E-01

RE(DELTA) = 6260.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.450	1.2213	0.7188E-04	0.2252E-05	0.5696	0.3684	-0.657E-02
0.400	1.1296	0.6389E-04	-0.2156E-05	0.5095	0.3541	0.609E-02
0.350	1.0241	0.5591E-04	-0.6309E-05	0.4495	0.3417	0.173E-01
0.300	0.9065	0.4792E-04	-0.9073E-05	0.4108	0.3309	0.257E-01
0.250	0.7804	0.3993E-04	-0.1009E-04	0.3873	0.3203	0.313E-01
0.200	0.6482	0.3194E-04	-0.9105E-05	0.3730	0.3085	0.328E-01
0.150	0.5123	0.2396E-04	-0.6214E-05	0.3617	0.2927	0.274E-01
0.100	0.3717	0.1597E-04	-0.1629E-05	0.3403	0.2690	0.933E-02
0.050	0.2179	0.7987E-05	0.3642E-05	0.3189	0.2294	-0.333E-01

NA = 0.0750 XW/U = 1.4000 WT = 5.4978

PROFILE COEFFICIENTS 0.04787 -1.42000 7.17780 -6.98060 -14.60200 35.54800 -26.85300 7.09990

RE(DELTA) = 2140.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5187	0.3037E-03	0.3542E-04	0.5358	0.4279	-0.267E-01
0.600	1.4238	0.2803E-03	0.2144E-04	0.5169	0.4214	-0.166E-01
0.550	1.3252	0.2570E-03	0.1046E-04	0.4981	0.4150	-0.842E-02
0.500	1.2230	0.2336E-03	0.2196E-05	0.4829	0.4088	-0.185E-02
0.450	1.1181	0.2102E-03	-0.3130E-05	0.4724	0.4024	0.283E-02
0.400	1.0113	0.1869E-03	-0.5841E-05	0.4647	0.3955	0.574E-02
0.350	0.9029	0.1635E-03	-0.5887E-05	0.4585	0.3876	0.639E-02
0.300	0.7932	0.1401E-03	-0.3551E-05	0.4531	0.3782	0.434E-02
0.250	0.6822	0.1168E-03	0.1028E-05	0.4462	0.3664	-0.143E-02
0.200	0.5691	0.9345E-04	0.7476E-05	0.4394	0.3514	-0.123E-01

RE(DELTA) = 2760.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5310	0.2355E-03	0.4188E-04	0.6213	0.4245	-0.469E-01
0.600	1.4480	0.2173E-03	0.2775E-04	0.5694	0.4143	-0.301E-01
0.550	1.3548	0.1992E-03	0.1554E-04	0.5174	0.4059	-0.163E-01
0.500	1.2545	0.1811E-03	0.5833E-05	0.4857	0.3985	-0.623E-02
0.450	1.1488	0.1630E-03	-0.1231E-05	0.4658	0.3917	0.137E-02
0.400	1.0398	0.1449E-03	-0.5615E-05	0.4529	0.3846	0.675E-02
0.350	0.9280	0.1268E-03	-0.746[illegible]E-05	0.4436	0.3771	0.984E-02
0.300	0.8144	0.1086E-03	-0.6854E-05	0.4367	0.3683	0.101E-01
0.250	0.6990	0.9057E-04	-0.4094E-05	0.4299	0.3576	0.695E-02
0.200	0.5818	0.7246E-04	0.7246E-06	0.4209	0.3437	-0.144E-02
0.150	0.4614	0.5434E-04	0.7028E-05	0.4119	0.3250	-0.173E-01

RE(DELTA) = 3820.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5021	0.1701E-03	0.4023E-04	0.8945	0.4327	-0.915E-01
0.600	1.4416	0.1570E-03	0.3324E-04	0.7683	0.4162	-0.676E-01
0.550	1.3712	0.1439E-[illegible]	0.2306E-04	0.6421	0.4011	-0.412E-01
0.500	1.2841	0.1308E-[illegible]	0.1293E-04	0.5390	0.3893	-0.207E-01
0.450	1.1849	0.1178[illegible]	0.4319E-05	0.4822	0.3797	-0.671E-02
0.400	1.0763	0.1047[illegible]	-0.1963E-05	0.4495	0.3716	0.313E-02
0.350	0.9623	0.9162E[illegible]	-0.5759E-05	0.4306	0.3637	0.984E-02
0.300	0.8440	0.7853[illegible]4	-0.7198E-05	0.4186	0.3554	0.136E-01
0.250	0.7234	0.6544[illegible]4	-0.6387E-05	0.4102	0.3455	0.138E-01
0.200	0.6002	0.5235E[illegible]4	-0.3560E-05	0.4018	0.3332	0.910E-02
0.150	0.4745	0.3926E-[illegible]	0.1047E-05	0.3885	0.3161	-0.327E-02
0.100	0.3427	0.2617E-04	0.6649E-05	0.3753	0.2918	-0.278E-01

RE(DELTA) = 6260.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.3313	0.8785E-04	0.1857E-04	0.8064	0.4131	-0.704E-01
0.500	1.2621	0.7987E-04	0.1659E-04	0.7452	0.3961	-0.613E-01
0.450	1.1970	0.7188E-04	0.1228E-04	0.6841	0.3759	-0.439E-01
0.400	1.1137	0.6389E-04	0.5958E-05	0.5437	0.3591	-0.182E-01
0.350	1.0111	0.5591E-04	0.2875E-06	0.4546	0.3461	-0.809E-03
0.300	0.8926	0.4792E-04	-0.3482E-05	0.4082	0.3360	0.997E-02
0.250	0.7659	0.3993E-04	-0.5175E-05	0.3859	0.3264	0.163E-01
0.200	0.6334	0.3194E-04	-0.4824E-05	0.3735	0.3157	0.178E-01
0.150	0.4982	0.2396E-04	-0.2603E-05	0.3624	0.3010	0.118E-01
0.100	0.3574	0.1597E-04	0.1102E-05	0.3513	0.2797	-0.678E-02

NA = 0.0750 XW/U = 2.5000 WT = 0.0000

PROFILE COEFFICIENTS 0.47385 -3.37890 11.69900 -16.79400 4.92620 11.00000 -10.93200 3.02440

RE(DELTA) = 3700.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.3601	0.1486E-03	0.4621E-04	0.5423	0.4043	-0.681E-01
0.500	1.2657	0.1351E-03	0.3062E-04	0.5029	0.3950	-0.450E-01
0.450	1.1607	0.1216E-03	0.1943E-04	0.4635	0.3876	-0.287E-01
0.400	1.0498	0.1081E-03	0.1167E-04	0.4422	0.3810	-0.181E-01
0.350	0.9345	0.9459E-04	0.6864E-05	0.4299	0.3745	-0.116E-01
0.300	0.8172	0.8108E-04	0.4378E-05	0.4219	0.3671	-0.836E-02
0.250	0.6975	0.6756E-04	0.4243E-05	0.4147	0.3584	-0.933E-02
0.200	0.5761	0.5405E-04	0.5783E-05	0.4065	0.3471	-0.151E-01
0.150	0.4515	0.4054E-04	0.8945E-05	0.3983	0.3322	-0.292E-01

RE(DELTA) = 5110.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.2642	0.1076E-03	0.5029E-04	-2.4537	0.4350	0.498E 00
0.500	1.2840	0.9784E-04	0.4189E-04	-0.9570	0.3894	0.159E 00
0.450	1.2022	0.8806E-04	0.2510E-04	0.5397	0.3743	-0.575E-01
0.400	1.0954	0.7827E-04	0.1459E-04	0.4454	0.3651	-0.303E-01
0.350	0.9771	0.6849E-04	0.7612E-05	0.4150	0.3582	-0.165E-01
0.300	0.8544	0.5870E-04	0.3776E-05	0.4015	0.3511	-0.907E-02
0.250	0.7280	0.4892E-04	0.1859E-05	0.3940	0.3434	-0.514E-02
0.200	0.6006	0.3913E-04	0.2309E-05	0.3851	0.3330	-0.756E-02
0.150	0.4683	0.2935E-04	0.4090E-05	0.3738	0.3203	-0.166E-01
0.100	0.3331	0.1956E-04	0.7103E-05	0.3625	0.3002	-0.395E-01

RE(DELTA) = 7000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.300	0.8941	0.4285E-04	0.4557E-05	0.3900	0.3355	-0.139E-01
0.250	0.7633	0.3571E-04	0.1671E-05	0.3768	0.3275	-0.577E-02
0.200	0.6287	0.2857E-04	0.8714E-06	0.3636	0.3181	-0.352E-02
0.150	0.4882	0.2142E-04	0.1657E-05	0.3534	0.3072	-0.839E-02
0.100	0.3458	0.1428E-04	0.3857E-05	0.3433	0.2891	-0.268E-01

NA = 0.0750 XW/U = 2.5000 WT = 1.5708

PROFILE COEFFICIENTS 0.26441 0.00283 -1.87030 9.44030 -24.31000 30.78700 -18.69600 4.39910

RE(DELTA) = 3700.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.4762	0.1486E-03	0.2967E-04	0.4176	0.3725	-0.310E-01
0.500	1.3568	0.1351E-03	0.1945E-04	0.4116	0.3685	-0.218E-01
0.450	1.2332	0.1216E-03	0.1189E-04	0.4056	0.3649	-0.144E-01
0.400	1.1103	0.1081E-03	0.6972E-05	0.4045	0.3602	-0.940E-02
0.350	0.9860	0.9459E-04	0.4324E-05	0.4030	0.3549	-0.654E-02
0.300	0.8622	0.8108E-04	0.3783E-05	0.4014	0.3479	-0.651E-02
0.250	0.7369	0.6756E-04	0.5054E-05	0.3984	0.3392	-0.101E-01
0.200	0.6112	0.5405E-04	0.7864E-05	0.3925	0.3272	-0.186E-01
0.150	0.4821	0.4054E-04	0.1183E-04	0.3866	0.3111	-0.351E-01

RE(DELTA) = 5100.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.5464	0.1078E-03	0.3476E-04	0.4077	0.3556	-0.467E-01
0.500	1.4228	0.9803E-04	0.2192E-04	0.3984	0.3514	-0.313E-01
0.450	1.2954	0.8823E-04	0.1272E-04	0.3892	0.3473	-0.195E-01
0.400	1.1659	0.7843E-04	0.6372E-05	0.3835	0.3430	-0.106E-01
0.350	1.0347	0.6862E-04	0.2470E-05	0.3797	0.3382	-0.462E-02
0.300	0.9026	0.5882E-04	0.6078E-06	0.3775	0.3323	-0.129E-02
0.250	0.7698	0.4901E-04	0.6666E-06	0.3753	0.3247	-0.165E-02
0.200	0.6362	0.3921E-04	0.2313E-05	0.3716	0.3143	-0.689E-02
0.150	0.5007	0.2941E-04	0.5333E-05	0.3678	0.2995	-0.199E-01

NA = 0.0750   XW/U = 2.5000   WT = 3.1416

PROFILE COEFFICIENTS -0.49097   3.37670 -7.13720 14.30400 -33.21300 46.40400 -31.27503   8.04700

RE(DELTA) =   900.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.750	1.6761	0.8333E-03	0.5088E-04	0.5235	0.4474	-0.143E-01
0.700	1.5805	0.7777E-03	0.4095E-04	0.5197	0.4428	-0.120E-01
0.650	1.4837	0.7222E-03	0.3255E-04	0.5159	0.4380	-0.101E-01
0.600	1.3867	0.6666E-03	0.2811E-04	0.5144	0.4326	-0.938E-02
0.550	1.2893	0.6111E-03	0.2688E-04	0.5133	0.4265	-0.963E-02
0.500	1.1919	0.5555E-03	0.2899E-04	0.5120	0.4194	-0.112E-01
0.450	1.0940	0.5000E-03	0.3388E-04	0.5096	0.4113	-0.142E-01
0.400	0.9957	0.4444E-03	0.4155E-04	0.5063	0.4017	-0.190E-01
0.350	0.8965	0.3888E-03	0.5177E-04	0.5007	0.3904	-0.260E-01
0.300	0.7960	0.3333E-03	0.6422E-04	0.4917	0.3768	-0.357E-01
0.250	0.6931	0.2777E-03	0.7844E-04	0.4826	0.3606	-0.491E-01

RE(DELTA) = 1100.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5182	0.5909E-03	0.1249E-04	0.5036	0.4281	-0.494E-02
0.600	1.4182	0.5454E-03	0.6636E-05	0.4997	0.4230	-0.257E-02
0.550	1.3181	0.4999E-03	0.3272E-05	0.4958	0.4172	-0.135E-02
0.500	1.2165	0.4545E-03	0.4090E-05	0.4933	0.4110	-0.182E-02
0.450	1.1154	0.4090E-03	0.7181E-05	0.4908	0.4036	-0.347E-02

RE(DELTA) = 1400.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5619	0.4642E-03	0.1928E-05	0.4826	0.4161	-0.834E-03
0.600	1.4582	0.4285E-03	-0.5857E-05	0.4796	0.4114	0.269E-02
0.550	1.3534	0.3929E-03	-0.1071E-04	0.4766	0.4063	0.528E-02
0.500	1.2484	0.3571E-03	-0.1242E-04	0.4750	0.4005	0.662E-02
0.450	1.1429	0.3214E-03	-0.1128E-04	0.4734	0.3937	0.654E-02
0.400	1.0372	0.2857E-03	-0.7357E-05	0.4721	0.3856	0.468E-02
0.350	0.9311	0.2499E-03	-0.9285E-06	0.4697	0.3758	0.659E-03
0.300	0.8243	0.2142E-03	0.7057E-05	0.4653	0.3639	-0.620E-02
0.250	0.7162	0.1785E-03	0.1064E-04	0.4568	0.3490	-0.166E-01
0.200	0.6054	0.1428E-03	0.3100E-04	0.4398	0.3303	-0.319E-01
0.150	0.4887	0.1071E-03	0.4450E-04	0.4228	0.3069	-0.539E-01

RE(DELTA) = 2000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.6268	0.3250E-03	0.2599E-05	0.4687	0.3995	-0.149E-02
0.600	1.5197	0.2999E-03	-0.7499E-05	0.4613	0.3948	0.459E-02
0.550	1.4100	0.2749E-03	-0.1505E-04	0.4539	0.3900	0.969E-02
0.500	1.2994	0.2500E-03	-0.1954E-04	0.4500	0.3847	0.135E-01
0.450	1.1878	0.2249E-03	-0.2130E-04	0.4470	0.3788	0.160E-01
0.400	1.0757	0.2000E-03	-0.2034E-04	0.4448	0.3718	0.168E-01
0.350	0.9630	0.1749E-03	-0.1694E-04	0.4428	0.3634	0.155E-01
0.300	0.8499	0.1499E-03	-0.1114E-04	0.4405	0.3529	0.115E-01
0.250	0.7360	0.1250E-03	-0.3300E-05	0.4359	0.3396	0.390E-02
0.200	0.6205	0.1000E-03	0.6399E-05	0.4313	0.3223	-0.889E-02

RE(DELTA) = 3700.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.6060	0.1621E-03	0.8243E-05	0.4869	0.3735	-0.924E-02
0.550	1.5014	0.1486E-03	-0.1540E-05	0.4614	0.3663	0.175E-02
0.500	1.3890	0.1351E-03	-0.9567E-05	0.4359	0.3599	0.111E-01
0.450	1.2719	0.1216E-03	-0.1508E-04	0.4204	0.3538	0.184E-01
0.400	1.1511	0.1081E-03	-0.1832E-04	0.4100	0.3474	0.241E-01
0.350	1.0280	0.9459E-04	-0.1921E-04	0.4034	0.3404	0.279E-01
0.300	0.9032	0.8109E-04	-0.1797E-04	0.3990	0.3321	0.293E-01
0.250	0.7774	0.6756E-04	-0.1456E-04	0.3957	0.3215	0.274E-01
0.200	0.6505	0.5405E-04	-0.9270E-05	0.3924	0.3074	0.206E-01

RE(DELTA) = 5110.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.5231	0.1076E-03	0.6183E-05	0.5138	0.3611	-0.106E-01
0.500	1.4227	0.9784E-04	-0.1409E-05	0.4726	0.3514	0.239E-02
0.450	1.3109	0.8806E-04	-0.7886E-05	0.4314	0.3432	0.132E-01
0.400	1.1906	0.7827E-04	-0.1248E-04	0.4069	0.3359	0.217E-01
0.350	1.0648	0.6849E-04	-0.1506E-04	0.3916	0.3287	0.283E-01
0.300	0.9352	0.5870E-04	-0.1559E-04	0.3824	0.3207	0.325E-01
0.250	0.8033	0.4892E-04	-0.1412E-04	0.3765	0.3112	0.338E-01
0.200	0.6696	0.3913E-04	-0.1078E-04	0.3717	0.2986	0.305E-01
0.150	0.5343	0.2935E-04	-0.5694E-05	0.3669	0.2807	0.199E-01

NA = 0.0750   XW/U = 2.5000   WT = 3.9270

PROFILE COEFFICIENTS -0.58911 2.51920 -1.45740 1.98070 -20.58100 40.54400 -30.72700 8.32760

RE(DELTA) = 800.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.5674	0.8750E-03	0.1625E-04	0.5312	0.4465	-0.440E-02
0.650	1.4726	0.8125E-03	0.9000E-05	0.5268	0.4413	-0.257E-02
0.600	1.3776	0.7499E-03	0.5625E-05	0.5224	0.4335	-0.170E-02
0.550	1.2812	0.6874E-03	0.6624E-05	0.5200	0.4292	-0.215E-02
0.500	1.1853	0.6250E-03	0.1049E-04	0.5194	0.4218	-0.368E-02
0.450	1.0887	0.5625E-03	0.1787E-04	0.5189	0.4133	-0.681E-02

RE(DELTA) = 900.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.5863	0.7777E-03	0.2999E-05	.5248	0.4412	-0.893E-03
0.650	1.4906	0.7222E-03	-0.4111E-05	0.5189	0.4360	0.128E-02
0.600	1.3936	0.6666E-03	-0.8272E-05	0.5130	0.4305	0.272E-02
0.550	1.2957	0.6111E-03	-0.8888E-05	0.5107	0.4244	0.315E-02
0.500	1.1978	0.5555E-03	-0.5999E-05	0.5096	0.4174	0.229E-02
0.450	1.0995	0.5000E-03	0.0000E 00	0.5081	0.4092	0.000E 00
0.400	1.0010	0.4444E-03	0.9111E-05	0.5065	0.3996	-0.414E-02

RE(DELTA) = 1400.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.6624	0.4999E-03	-0.8357E-05	0.4947	0.4210	0.348E-02
0.650	1.5609	0.4642E-03	-0.1949E-04	0.4892	0.4164	0.855E-02
0.600	1.4580	0.4285E-03	-0.2742E-04	0.4838	0.4115	0.127E-01
0.550	1.3542	0.3928E-03	-0.3200E-04	0.4793	0.4061	0.158E-01
0.500	1.2494	0.3571E-03	-0.3364E-04	0.4761	0.4001	0.179E-01
0.450	1.1442	0.3214E-03	-0.3221E-04	0.4739	0.3932	0.186E-01
0.400	1.0384	0.2857E-03	-0.2785E-04	0.4719	0.3852	0.177E-01
0.350	0.9323	0.2499E-03	-0.2064E-04	0.4697	0.3754	0.145E-01
0.300	0.8255	0.2142E-03	-0.1085E-04	0.4659	0.3634	0.858E-02
0.250	0.7177	0.1785E-03	0.1142E-05	0.4591	0.3483	-0.102E-02
0.200	0.6077	0.1428E-03	0.1507E-04	0.4446	0.3291	-0.154E-01
0.150	0.4927	0.1071E-03	0.3049E-04	0.4301	0.3044	-0.372E-01

RE(DELTA) = 2000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.750	1.8125	0.3750E-03	0.1780E-04	0.5244	0.4137	-0.103E-01
0.700	1.7158	0.3499E-03	0.2250E-05	0.5065	0.4079	-0.132E-02
0.650	1.6150	0.3250E-03	-0.1075E-04	0.4886	0.4024	0.650E-02
0.600	1.5111	0.2999E-03	-0.2094E-04	0.4744	0.3970	0.131E-01
0.550	1.4042	0.2749E-03	-0.2814E-04	0.4632	0.3916	0.185E-01
0.500	1.2952	0.2500E-03	-0.3290E-04	0.4558	0.3860	0.231E-01
0.450	1.1848	0.2249E-03	-0.3465E-04	0.4508	0.3798	0.263E-01
0.400	1.0734	0.2000E-03	-0.3370E-04	0.4472	0.3726	0.280E-01
0.350	0.9612	0.1749E-03	-0.2999E-04	0.4444	0.3641	0.277E-01
0.300	0.8484	0.1499E-03	-0.2379E-04	0.4417	0.3536	0.247E-01
0.250	0.7348	0.1250E-03	-0.1524E-04	0.4374	0.3402	0.181E-01
0.200	0.6198	0.1000E-03	-0.4649E-05	0.4288	0.3226	0.643E-02
0.150	0.5016	0.7499E-04	0.7550E-05	0.4203	0.2990	-0.126E-01

RE(DELTA) = 3700.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.5692	0.1621E-03	0.2702E-07	0.5309	0.3823	-0.338E-04
0.550	1.4725	0.1486E-03	-0.8081E-05	0.4966	0.3735	0.100E-01
0.500	1.3675	0.1351E-03	-0.1532E-04	0.4623	0.3656	0.191E-01
0.450	1.2560	0.1216E-03	-0.2059E-04	0.4389	0.3582	0.266E-01
0.400	1.1396	0.1081E-03	-0.2383E-04	0.4227	0.3510	0.327E-01
0.350	1.0194	0.9459E-04	-0.2483E-04	0.4115	0.3433	0.371E-01
0.300	0.8966	0.8108E-04	-0.2364E-04	0.4043	0.3345	0.394E-01
0.250	0.7721	0.6756E-04	-0.2024E-04	0.3992	0.3237	0.387E-01
0.200	0.6461	0.5405E-04	-0.1475E-04	0.3937	0.3095	0.332E-01
0.150	0.5181	0.4054E-04	-0.7351E-05	0.3882	0.2895	0.203E-01

RE(DELTA) = 5110.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.4798	0.1076E-03	-0.1076E-05	0.5529	0.3716	0.205E-02
0.500	1.3861	0.9784E-04	-0.6457E-05	0.5085	0.3607	0.121E-01
0.450	1.2827	0.8806E-04	-0.1181E-04	0.4641	0.3508	0.218E-01
0.400	1.1703	0.7827E-04	-0.1590E-04	0.4309	0.3417	0.299E-01
0.350	1.0504	0.6849E-04	-0.1843E-04	0.4075	0.3332	0.365E-01
0.300	0.9248	0.5870E-04	-0.1904E-04	0.3923	0.3243	0.412E-01
0.250	0.7955	0.4892E-04	-0.1771E-04	0.3827	0.3142	0.435E-01
0.200	0.6635	0.3913E-04	-0.1438E-04	0.3756	0.3014	0.416E-01
0.150	0.5293	0.2935E-04	-0.9158E-05	0.3674	0.2833	0.324E-01
0.100	0.3913	0.1956E-04	-0.2348E-05	0.3592	0.2555	0.110E-01

NA = 0.0750   XW/U = 2.5000   WT = 4.7124

PROFILE COEFFICIENTS -0.32731 -0.00438 7.09600 -13.69400 -2.02140 25.63400 -23.36000 6.69400

RE(DELTA) = 800.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.4353	0.8125E-03	0.1062E-04	0.5389	0.4528	-0.319E-02
0.600	1.3419	0.7499E-03	0.6875E-05	0.5347	0.4471	-0.219E-02
0.550	1.2483	0.6874E-03	0.6250E-05	0.5305	0.4405	-0.212E-02
0.500	1.1534	0.6250E-03	0.9375E-05	0.5271	0.4335	-0.342E-02
0.450	1.0586	0.5625E-03	0.1550E-04	0.5237	0.4250	-0.613E-02

RE(DELTA) = 900.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.4520	0.7222E-03	-0.4444E-06	0.5301	0.4476	0.146E-03
0.600	1.3570	0.6666E-03	-0.5333E-05	0.5257	0.4421	0.185E-02
0.550	1.2618	0.6111E-03	-0.6888E-05	0.5214	0.4358	0.256E-02
0.500	1.1652	0.5555E-03	-0.5222E-05	0.5181	0.4291	0.208E-02
0.450	1.0688	0.5000E-03	-0.2222E-06	0.5148	0.4210	0.963E-04

RE(DELTA) = 1000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.4659	0.6500E-03	-0.1200E-05	0.5300	0.4434	0.260E-02
0.600	1.3709	0.5999E-03	-0.1259E-04	0.5219	0.4376	0.479E-02
0.550	1.2743	0.5499E-03	-0.1530E-04	0.5139	0.4316	0.617E-02
0.500	1.1763	0.5000E-03	-0.1460E-04	0.5102	0.4250	0.633E-02
0.450	1.0783	0.4499E-03	-0.1079E-04	0.5083	0.4173	0.509E-02
0.400	0.9796	0.4000E-03	-0.3900E-05	0.5055	0.4083	0.201E-02
0.350	0.8805	0.3499E-03	0.5699E-05	0.5027	0.3975	-0.325E-02

RE(DELTA) = 1400.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5159	0.4642E-03	-0.1092E-04	0.5057	0.4287	0.510E-02
0.600	1.4166	0.4285E-03	-0.1964E-04	0.4992	0.4235	0.969E-02
0.550	1.3156	0.3928E-03	-0.2549E-04	0.4928	0.4180	0.133E-01
0.500	1.2137	0.3571E-03	-0.2807E-04	0.4885	0.4119	0.158E-01
0.450	1.1109	0.3214E-03	-0.2764E-04	0.4847	0.4050	0.168E-01
0.400	1.0074	0.2857E-03	-0.2435E-04	0.4814	0.3970	0.162E-01
0.350	0.9032	0.2499E-03	-0.1828E-04	0.4780	0.3875	0.135E-01
0.300	0.7982	0.2142E-03	-0.9642E-05	0.4735	0.3758	0.800E-02
0.250	0.6920	0.1785E-03	0.1285E-05	0.4658	0.3612	-0.121E-02
0.200	0.5835	0.1428E-03	0.1414E-04	0.4510	0.3427	-0.153E-01
0.150	0.4702	0.1071E-03	0.2828E-04	0.4363	0.3190	-0.367E-01

RE(DELTA) = 2000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5613	0.3250E-03	-0.1650E-05	0.5131	0.4163	0.108E-02
0.600	1.4626	0.2999E-03	-0.1230E-04	0.4983	0.4102	0.838E-02
0.550	1.3606	0.2749E-03	-0.2029E-04	0.4836	0.4042	0.144E-01
0.500	1.2558	0.2500E-03	-0.2580E-04	0.4726	0.3981	0.194E-01
0.450	1.1490	0.2249E-03	-0.2849E-04	0.4647	0.3916	0.230E-01
0.400	1.0406	0.2000E-03	-0.2854E-04	0.4589	0.3843	0.251E-01
0.350	0.9311	0.1749E-03	-0.2585E-04	0.4543	0.3758	0.252E-01
0.300	0.8205	0.1499E-03	-0.2074E-04	0.4498	0.3656	0.227E-01
0.250	0.7088	0.1250E-03	-0.1324E-04	0.4446	0.3527	0.166E-01
0.200	0.5956	0.1000E-03	-0.3699E-05	0.4350	0.3357	0.540E-02
0.150	0.4789	0.7499E-04	0.7499E-05	0.4254	0.3132	-0.133E-01

RE(DELTA) = 3700.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.5006	0.1621E-03	0.5891E-05	0.5877	0.3998	-0.853E-02
0.550	1.4125	0.1486E-03	-0.1459E-05	0.5436	0.3893	0.207E-02
0.500	1.3163	0.1351E-03	-0.8621E-05	0.4995	0.3798	0.121E-01
0.450	1.2120	0.1216E-03	-0.1429E-04	0.4661	0.3712	0.203E-01
0.400	1.1016	0.1081E-03	-0.1821E-04	0.4428	0.3631	0.270E-01
0.350	0.9861	0.9459E-04	-0.2002E-04	0.4267	0.3549	0.320E-01
0.300	0.8672	0.8108E-04	-0.1967E-04	0.4160	0.3459	0.349E-01
0.250	0.7457	0.6756E-04	-0.1716E-04	0.4080	0.3352	0.347E-01
0.200	0.6221	0.5405E-04	-0.1254E-04	0.4006	0.3214	0.298E-01
0.150	0.4961	0.4054E-04	-0.6027E-05	0.3933	0.3023	0.176E-01

RE(DELTA) = 5100.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.4105	0.1078E-03	0.2901E-05	0.6065	0.3899	-0.636E-02
0.500	1.3243	0.9803E-04	-0.1490E-05	0.5571	0.3775	0.319E-02
0.450	1.2307	0.8823E-04	-0.6509E-05	0.5077	0.3656	0.136E-01
0.400	1.1268	0.7843E-04	-0.1080E-04	0.4624	0.3549	0.226E-01
0.350	1.0141	0.6862E-04	-0.1390E-04	0.4296	0.3451	0.300E-01
0.300	0.8938	0.5882E-04	-0.1523E-04	0.4076	0.3356	0.354E-01
0.250	0.7687	0.4901E-04	-0.1466E-04	0.3936	0.3252	0.383E-01
0.200	0.6397	0.3921E-04	-0.1209E-04	0.3833	0.3126	0.369E-01
0.150	0.5078	0.2941E-04	-0.7647E-05	0.3728	0.2953	0.286E-01
0.100	0.3714	0.1960E-04	-0.1588E-05	0.3623	0.2692	0.790E-02

NA = 0.0750 XW/U = 2.5000 WT = 5.4978

PROFILE COEFFICIENTS 0.13095 -2.52570 12.66000 -21.51900 8.52470 13.38600 -15.12100 4.48040

RE(DELTA) = 1000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.2179	0.5499E-03	0.2090E-04	0.5312	0.4515	-0.911E-02
0.500	1.1228	0.5000E-03	0.1970E-04	0.5274	0.4453	-0.925E-02
0.450	1.0283	0.4499E-03	0.2069E-04	0.5236	0.4376	-0.105E-01
0.400	0.9318	0.4000E-03	0.2500E-04	0.5184	0.4292	-0.139E-01
0.350	0.8354	0.3499E-03	0.3129E-04	0.5134	0.4189	-0.192E-01
0.300	0.7370	0.2999E-03	0.4020E-04	0.5083	0.4070	-0.277E-01

RE(DELTA) = 1700.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.2830	0.3235E-03	0.4705E-05	0.5046	0.4286	-0.314E-02
0.500	1.1835	0.2941E-03	-0.1058E-05	0.4968	0.4224	0.755E-03
0.450	1.0817	0.2647E-03	-0.4470E-05	0.4890	0.4160	0.343E-02
0.400	0.9790	0.2352E-03	-0.5176E-05	0.4833	0.4085	0.434E-02
0.350	0.8748	0.2058E-03	-0.3294E-05	0.4776	0.4000	0.305E-02

RE(DELTA) = 3700.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.4234	0.1621E-03	0.2786E-04	0.7128	0.4215	-0.516E-01
0.550	1.3486	0.1486E-03	0.1916E-04	0.6304	0.4078	-0.331E-01
0.500	1.2642	0.1351E-03	0.1008E-04	0.5479	0.3955	-0.161E-01
0.450	1.1649	0.1216E-03	0.2351E-05	0.4885	0.3862	-0.364E-02
0.400	1.0593	0.1081E-03	-0.3324E-05	0.4589	0.3776	0.532E-02
0.350	0.9468	0.9459E-04	-0.6837E-05	0.4394	0.3696	0.117E-01
0.300	0.8317	0.8108E-04	-0.7891E-05	0.4267	0.3607	0.149E-01
0.250	0.7124	0.6756E-04	-0.6972E-05	0.4168	0.3509	0.150E-01
0.200	0.5918	0.5405E-04	-0.3864E-05	0.4074	0.3379	0.984E-02
0.150	0.4669	0.4054E-04	0.7837E-06	0.3980	0.3212	-0.247E-02

RE(DELTA) = 5110.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.3973	0.1174E-03	0.2189E-04	0.7769	0.4293	-0.622E-01
0.550	1.3282	0.1076E-03	0.1917E-04	0.7299	0.4140	-0.538E-01
0.500	1.2603	0.9784E-04	0.1457E-04	0.6830	0.3967	-0.403E-01
0.450	1.1809	0.8806E-04	0.8219E-05	0.5791	0.3810	-0.205E-01
0.400	1.0863	0.7827E-04	0.2015E-05	0.4951	0.3682	-0.469E-02
0.350	0.9780	0.6849E-04	-0.2818E-05	0.4445	0.3578	0.654E-02
0.300	0.8610	0.5870E-04	-0.5616E-05	0.4170	0.3484	0.139E-01
0.250	0.7381	0.4892E-04	-0.6379E-05	0.4008	0.3387	0.177E-01
0.200	0.6115	0.3913E-04	-0.5048E-05	0.3893	0.3270	0.164E-01
0.150	0.4812	0.2935E-04	-0.2015E-05	0.3777	0.3117	0.808E-02

NA = 0.0750 XW/U = 5.0600 WT = 0.0000

PROFILE COEFFICIENTS 0.74534 -6.83360 28.11500 -54.10000 49.51600 -16.70300 -3.27400 2.55490

RE(DELTA) = 3000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.400	0.9887	0.1333E-03	0.1766E-05	0.4864	0.4045	-0.260E-02
0.350	0.8851	0.1166E-03	-0.1666E-06	0.4738	0.3954	0.267E-03
0.300	0.7776	0.9999E-04	0.0000E 00	0.4612	0.3858	0.000E 00
0.250	0.6683	0.8333E-04	0.1699E-05	0.4513	0.3740	-0.344E-02
0.200	0.5560	0.6666E-04	0.5366E-05	0.4392	0.3597	-0.127E-01
0.150	0.4406	0.4999E-04	0.9699E-05	0.4271	0.3404	-0.282E-01

RE(DELTA) = 5250.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.4615	0.1333E-03	0.2401E-04	0.6777	0.4789	-0.584E-01
0.650	1.3896	0.1238E-03	0.2285E-04	0.7048	0.4677	-0.608E-01
0.600	1.3196	0.1142E-03	0.2198E-04	0.7319	0.4546	-0.640E-01
0.550	1.2529	0.1047E-03	0.2074E-04	0.7630	0.4389	-0.663E-01
0.500	1.1885	0.9523E-04	0.1834E-04	0.7494	0.4206	-0.607E-01
0.450	1.1193	0.8571E-04	0.1337E-04	0.6553	0.4020	-0.411E-01
0.400	1.0343	0.7619E-04	0.7619E-05	0.5431	0.3867	-0.210E-01
0.350	0.9339	0.6666E-04	0.2971E-05	0.4785	0.3747	-0.799E-02
0.300	0.8250	0.5714E-04	0.3238E-06	0.4426	0.3636	-0.912E-03
0.250	0.7077	0.4761E-04	-0.8380E-06	0.4212	0.3532	0.261E-02
0.200	0.5876	0.3809E-04	0.0000E 00	0.4057	0.3402	0.000E 00
0.150	0.4611	0.2857E-04	0.2152E-05	0.3932	0.3253	-0.963E-02
0.100	0.3333	0.1904E-04	0.5390E-05	0.3638	0.3000	-0.308E-01
0.050	0.1847	0.9523E-05	0.7980E-05	0.3344	0.2707	-0.758E-01

RE(DELTA) = 7250.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.900	1.7512	0.1241E-03	0.2295E-04	0.7243	0.5139	-0.688E-01
0.800	1.6104	0.1103E-03	0.1940E-04	0.6964	0.4967	-0.608E-01
0.700	1.4639	0.9655E-04	0.1637E-04	0.6684	0.4781	-0.542E-01
0.650	1.3883	0.8965E-04	0.1522E-04	0.6600	0.4681	-0.524E-01
0.600	1.3124	0.8275E-04	0.1427E-04	0.6561	0.4571	-0.517E-01
0.550	1.2359	0.7586E-04	0.1382E-04	0.6683	0.4450	-0.541E-01
0.500	1.1627	0.6896E-04	0.1343E-04	0.7043	0.4300	-0.590E-01
0.450	1.0938	0.6206E-04	0.1303E-04	0.7445	0.4114	-0.643E-01
0.400	1.0283	0.5517E-04	0.1086E-04	0.7106	0.3889	-0.544E-01
0.350	0.9523	0.4827E-04	0.6524E-05	0.5714	0.3675	-0.283E-01
0.300	0.8492	0.4137E-04	0.2317E-05	0.4587	0.3532	-0.907E-02
0.250	0.7336	0.3448E-04	0.8275E-07	0.4162	0.3407	-0.340E-03
0.200	0.6086	0.2758E-04	-0.4827E-06	0.3929	0.3286	0.225E-02
0.150	0.4790	0.2068E-04	0.5931E-06	0.3744	0.3131	-0.336E-02
0.100	0.3413	0.1379E-04	0.2896E-05	0.3491	0.2929	-0.214E-01
0.050	0.1921	0.6896E-05	0.5089E-05	0.3237	0.2602	-0.621E-01

NA = 0.0750 XW/U = 5.0600 WT = 1.5708

PROFILE COEFFICIENTS 0.45696 0.00022 -11.39300 54.90800-119.13000 133.75003 -75.72700 17.15800

RE(DELTA) = 5250.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.750	2.3872	0.1428E-03	0.1293E-03	0.2306	0.3141	-0.656E-01
0.700	2.1772	0.1333E-03	0.1099E-03	0.2423	0.3215	-0.642E-01
0.650	1.9744	0.1238E-03	0.9150E-04	0.2539	0.3292	-0.617E-01
0.600	1.7831	0.1142E-03	0.7312E-04	0.2735	0.3364	-0.588E-01
0.550	1.6081	0.1047E-03	0.5561E-04	0.2994	0.3420	-0.543E-01
0.500	1.4485	0.9523E-04	0.4026E-04	0.3283	0.3451	-0.479E-01
0.450	1.3029	0.8571E-04	0.2773E-04	0.3498	0.3453	-0.391E-01
0.400	1.1626	0.7619E-04	0.1906E-04	0.3588	0.3440	-0.308E-01
0.350	1.0242	0.6666E-04	0.1240E-04	0.3677	0.3417	-0.233E-01
0.300	0.8906	0.5714E-04	0.8895E-05	0.3738	0.3368	-0.196E-01
0.250	0.7567	0.4761E-04	0.7371E-05	0.3728	0.3303	-0.190E-01
0.200	0.6224	0.3809E-04	0.7523E-05	0.3709	0.3213	-0.235E-01
0.150	0.4871	0.2857E-04	0.9142E-05	0.3625	0.3079	-0.357E-01
0.100	0.3465	0.1904E-04	0.1131E-04	0.3309	0.2886	-0.567E-01
0.050	0.1832	0.9523E-05	0.1230E-04	0.2992	0.2729	-0.105E 00

RE(DELTA) = 10000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.300	1.0095	0.2999E-04	0.6150E-05	0.3100	0.2971	-0.188E-01
0.250	0.8503	0.2500E-04	0.3120E-05	0.3153	0.2940	-0.115E-01
0.200	0.6924	0.1999E-04	0.1920E-05	0.3206	0.2888	-0.889E-02
0.150	0.5384	0.1499E-04	0.2279E-05	0.3217	0.2786	-0.136E-01
0.100	0.3816	0.9999E-05	0.3770E-05	0.3035	0.2620	-0.299E-01
0.050	0.2081	0.4999E-05	0.5470E-05	0.2852	0.2402	-0.749E-01

NA = 0.0750 XW/U = 5.0600 WT = 1.5708 (HIGHER MODE SOLUTIONS)

PROFILE COEFFICIENTS 0.45696 0.00022 -11.39300 54.90800-119.13000 133.75003 -75.7270) 17.15800

RE(DELTA) = 5250.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.950	1.6482	0.1809E-03	0.7318E-04	0.9338	0.5763	-0.217E 00
0.900	1.5925	0.1714E-03	0.7120E-04	0.8769	0.5651	-0.205E 00
0.850	1.5341	0.1619E-03	0.6902E-04	0.8199	0.5540	-0.193E 0C
0.800	1.4703	0.1523E-03	0.6672E-04	0.7589	0.5441	-0.180E 00
0.750	1.4022	0.1428E-03	0.6500E-04	0.7035	0.5348	-0.171E 00
0.700	1.3279	0.1333E-03	0.6373E-04	0.6443	0.5271	-0.162E 00
0.650	1.2467	0.1238E-03	0.6361E-04	0.5949	0.5213	-0.159E 00
0.600	1.1596	0.1142E-03	0.6400E-04	0.5338	0.5174	-0.154E 00
0.550	1.0583	0.1047E-03	0.6500E-04	0.4672	0.5197	-0.150E 00
0.500	0.9449	0.9523E-04	0.6554E-04	0.4275	0.5291	-0.155E 00
0.450	0.8242	0.8571E-04	0.6403E-04	0.4127	0.5459	-0.168E 00
0.400	0.7026	0.7619E-04	0.6038E-04	0.4154	0.5693	-0.187E 00
0.350	0.5835	0.6666E-04	0.5546E-04	0.4201	0.5998	-0.209E 00
0.300	0.4646	0.5714E-04	0.4919E-04	0.4391	0.6457	-0.244E 00
0.250	0.3554	0.4761E-04	0.4142E-04	0.4562	0.7034	-0.279E 00
0.230	0.3115	0.4380E-04	0.3780E-04	0.5135	0.7383	-0.327E 00
0.210	0.2765	0.3999E-04	0.3384E-04	0.5758	0.7594	-0.370E 00
0.200	0.2592	0.3809E-04	0.3236E-04	0.5938	0.7716	-0.389E 00
0.190	0.2428	0.3619E-04	0.3137E-04	0.5906	0.7825	-0.400E 00
0.170	0.2066	0.3238E-04	0.3022E-04	-0.6009	0.8228	0.461E 00
0.150	0.2180	0.2857E-04	0.4316E-04	-1.5864	0.6880	0.164E 01
0.130	0.2321	0.2476E-04	0.3672E-04	-0.7341	0.5601	0.609E 00
0.100	0.1295	0.1904E-04	0.2081E-04	0.5443	0.7722	-0.459E 00

RE(DELTA) = 7250.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.3580	0.9655E-04	0.4801E-04	0.7528	0.5154	-0.192E 00
0.650	1.2880	0.8965E-04	0.4608E-04	0.6784	0.5046	-0.175E 00
0.600	1.2102	0.8275E-04	0.4502E-04	0.6041	0.4957	-0.162E 00
0.550	1.1218	0.7586E-04	0.4455E-04	0.5310	0.4902	-0.152E 00
0.500	1.0211	0.6896E-04	0.4478E-04	0.4635	0.4896	-0.147E 00
0.450	0.9050	0.6206E-04	0.4484E-04	0.4131	0.4972	-0.148E 00
0.400	0.7786	0.5517E-04	0.4353E-04	0.3920	0.5137	-0.158E 00
0.350	0.6499	0.4827E-04	0.4055E-04	0.3942	0.5385	-0.178E 00
0.300	0.5249	0.4137E-04	0.3635E-04	0.4055	0.5715	-0.203E 00
0.250	0.4033	0.3448E-04	0.3103E-04	0.4298	0.6198	-0.239E 00
0.200	0.2918	0.2758E-04	0.2470E-04	0.4785	0.6854	-0.293E 00
0.150	0.1935	0.2068E-04	0.1750E-04	0.5711	0.7751	-0.374E 00
0.100	0.1146	0.1379E-04	0.9558E-05	0.0251	0.8726	-0.152E-01
0.050	0.2003	0.6896E-05	0.7958E-05	-0.5208	0.2496	0.150E 00

NA = 0.0750 XW/U = 5.0600 WT = 1.5708 (TEMPORAL DATA)

PROFILE COEFFICIENTS 0.45696 0.00022 -11.39300 54.90800-119.13000 133.75003 -75.72700 17.15800

RE(DELTA) = 5250.

ALFAR*DELTA	BETAR*NU/U**2	BETAI*NU/U**2	CIMAG	GROUP VEL.	WAVE VEL.	ALFAI*NU/U
3.2600	0.1634E-03	-0.3711E-04	-0.0597	0.1672	0.2632	0.2219E-03
3.0600	0.1570E-03	-0.3410E-04	-0.0585	0.1787	0.2693	0.1907E-03
2.8600	0.1498E-03	-0.3181E-04	-0.0584	0.1902	0.2750	0.1671E-03
2.6600	0.1425E-03	-0.2930E-04	-0.0578	0.1954	0.2812	0.1499E-03
2.4600	0.1349E-03	-0.2661E-04	-0.0567	0.2015	0.2879	0.1320E-03
2.2600	0.1271E-03	-0.2379E-04	-0.0552	0.2100	0.2954	0.1132E-03
2.0600	0.11[illegible]E-03	-0.2091E-04	-0.0535	0.2215	0.3031	0.9441E-04
1.9600	0.1146E-03	-0.1953E-04	-0.0523	0.2233	0.3071	0.8747E-04
1.8600	0.1104E-03	-0.1779E-04	-0.0502	0.2274	0.3117	0.7826E-04
1.7600	0.1060E-03	-0.1623E-04	-0.0484	0.2396	0.3162	0.6776E-04
1.6600	0.1013E-03	-0.1463E-04	-0.0462	0.2500	0.3203	0.5851E-04
1.5600	0.9647E-04	-0.1289E-04	-0.0434	0.2579	0.3246	0.5000E-04
1.4600	0.9147E-04	-0.1113E-04	-0.0400	0.2721	0.3289	0.4092E-04
1.3600	0.8611E-04	-0.9409E-05	-0.0363	0.2894	0.3324	0.3250E-04
1.2600	0.8045E-04	-0.7716E-05	-0.0321	0.2996	0.3352	0.2575E-04
1.1600	0.7469E-04	-0.6146E-05	-0.0278	0.3211	0.3380	0.1913E-04
1.0600	0.6821E-04	-0.4775E-05	-0.0236	0.3479	0.3378	0.1372E-04
0.9600	0.6144E-04	-0.3748E-05	-0.0205	0.3544	0.3360	0.1057E-04
0.8600	0.5471E-04	-0.3053E-05	-0.0186	0.3566	0.3340	0.8559E-05
0.7600	0.4785E-04	-0.2699E-05	-0.0186	0.3647	0.3305	0.7399E-05
0.6600	0.4081E-04	-0.2697E-05	-0.0214	0.3676	0.3246	0.7336E-05
0.5600	0.3384E-04	-0.2979E-05	-0.0279	0.3637	0.3173	0.8190E-05
0.4600	0.2696E-04	-0.3445E-05	-0.0393	0.3591	0.3077	0.9594E-05
0.3600	0.2016E-04	-0.3857E-05	-0.0562	0.3486	0.2940	0.1106E-04
0.2600	0.1367E-04	-0.3838E-05	-0.0775	0.3197	0.2762	0.1200E-04
0.1600	0.7982E-05	-0.3144E-05	-0.1031	0.2908	0.2619	0.1081E-04

NA = 0.0750 XW/U = 5.0600 WT = 1.5708 (TEMPORAL DATA, HIGHER MODE SOLUTIONS)

PROFILE COEFFICIENTS 0.45696 0.00022 -11.39300 54.90800-119.13000 133.75003 -75.72700 17.15800

RE(DELTA) = 5250.

ALFAR*DELTA	BETAR*NU/U**2	BETAI*NU/U**2	CIMAG	GROUP VEL.	WAVE VEL.	ALFAI*NU/U
1.7500	0.1638E-03	-0.5100E-04	-0.1530	0.3787	0.4916	0.1346E-03
1.6500	0.1563E-03	-0.4677E-04	-0.1488	0.4216	0.4975	0.1109E-03
1.5500	0.1478E-03	-0.4272E-04	-0.1447	0.4645	0.5007	0.9196E-04
1.4500	0.1386E-03	-0.3913E-04	-0.1417	0.4817	0.5020	0.8123E-04
1.3500	0.1294E-03	-0.3638E-04	-0.1415	0.4934	0.5035	0.7373E-04
1.2500	0.1198E-03	-0.3414E-04	-0.1434	0.4955	0.5034	0.6890E-04
1.1500	0.1106E-03	-0.3246E-04	-0.1482	0.4810	0.5049	0.6748E-04
1.0500	0.1015E-03	-0.3098E-04	-0.1549	0.4715	0.5077	0.6570E-04
0.9500	0.9263E-04	-0.2959E-04	-0.1635	0.4633	0.5119	0.6387E-04
0.8500	0.8389E-04	-0.2819E-04	-0.1741	0.4565	0.5181	0.6176E-04
0.7500	0.7524E-04	-0.2669E-04	-0.1868	0.4534	0.5267	0.5887E-04
0.6500	0.6662E-04	-0.2498E-04	-0.2018	0.4535	0.5380	0.5509E-04
0.5500	0.5797E-04	-0.2299E-04	-0.2195	0.4561	0.5533	0.5041E-04
0.4500	0.4924E-04	-0.2067E-04	-0.2412	0.4588	0.5745	0.4506E-04

NA = 0.0750 XW/U = 5.0600 WT = 3.1416

PROFILE COEFFICIENTS -0.76094 6.83340 -23.59700 51.79700 -78.09001 74.26200 -38.91500 8.48810

RE(DELTA) = 2000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.5773	0.2999E-03	0.8000E-05	0.4228	0.3803	-0.428E-02
0.500	1.3404	0.2500E-03	-0.7750E-05	0.4231	0.3730	0.489E-02
0.450	1.2224	0.2249E-03	-0.1065E-04	0.4233	0.3681	0.737E-02
0.400	1.1042	0.2000E-03	-0.1094E-04	0.4222	0.3622	0.837E-02
0.350	0.9856	0.1749E-03	-0.8499E-05	0.4214	0.3551	0.726E-02
0.300	0.8669	0.1499E-03	-0.3600E-05	0.4201	0.3460	0.348E-02
0.250	0.7476	0.1250E-03	0.3650E-05	0.4168	0.3344	-0.407E-02
0.200	0.6270	0.1000E-03	0.1275E-04	0.4077	0.3189	-0.165E-01
0.150	0.5023	0.7499E-04	0.2330E-04	0.3987	0.2986	-0.369E-01

RE(DELTA) = 4070.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.7191	0.1474E-03	0.1975E-04	0.4258	0.3490	-0.199E-01
0.550	1.6002	0.1351E-03	0.7051E-05	0.4082	0.3437	-0.732E-02
0.500	1.4739	0.1228E-03	-0.2825E-05	0.3905	0.3392	0.304E-02
0.450	1.3441	0.1105E-03	-0.9926E-05	0.3809	0.3347	0.114E-01
0.400	1.2114	0.9828E-04	-0.1434E-04	0.3748	0.3301	0.180E-01
0.350	1.0773	0.8599E-04	-0.1626E-04	0.3716	0.3248	0.228E-01
0.300	0.9423	0.7371E-04	-0.1587E-04	0.3699	0.3183	0.253E-01
0.250	0.8070	0.6142E-04	-0.1329E-04	0.3687	0.3097	0.247E-01
0.200	0.6711	0.4914E-04	-0.8673E-05	0.3663	0.2980	0.192E-01
0.150	0.5340	0.3685E-04	-0.2285E-05	0.3638	0.2808	0.633E-02

RE(DELTA) = 6000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.6363	0.9166E-04	0.1551E-04	0.4741	0.3361	-0.269E-01
0.500	1.5281	0.8333E-04	0.5483E-05	0.4312	0.3272	-0.928E-02
0.450	1.4032	0.7500E-04	-0.2616E-05	0.3882	0.3206	0.434E-02
0.400	1.2703	0.6666E-04	-0.8483E-05	0.3679	0.3148	0.147E-01
0.350	1.1313	0.5833E-04	-0.1213E-04	0.3555	0.3093	0.228E-01
0.300	0.9890	0.4999E-04	-0.1359E-04	0.3489	0.3033	0.287E-01
0.250	0.8447	0.4166E-04	-0.1303E-04	0.3454	0.2959	0.319E-01
0.200	0.6995	0.3333E-04	-0.1049E-04	0.3429	0.2859	0.308E-01
0.150	0.5531	0.2499E-04	-0.6216E-05	0.3382	0.2711	0.228E-01
0.100	0.4038	0.1666E-04	-0.4333E-06	0.3334	0.2476	0.214E-02

RE(DELTA) = 7250.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.450	1.4213	0.6206E-04	0.8275E-06	0.4017	0.3166	-0.169E-02
0.400	1.2949	0.5517E-04	-0.5200E-05	0.3777	0.3089	0.109E-01
0.350	1.1560	0.4827E-04	-0.9462E-05	0.3538	0.3027	0.209E-01
0.300	1.0122	0.4137E-04	-0.1165E-04	0.3427	0.2963	0.286E-01
0.250	0.8642	0.3448E-04	-0.1191E-04	0.3360	0.2892	0.335E-01
0.200	0.7146	0.2758E-04	-0.1024E-04	0.3323	0.2798	0.345E-01
0.150	0.5633	0.2068E-04	-0.6882E-05	0.3281	0.2662	0.290E-01
0.100	0.4098	0.1379E-04	-0.1944E-05	0.3123	0.2440	0.107E-01
0.050	0.2426	0.6896E-05	0.3779E-05	0.2966	0.2061	-0.335E-01

NA = 0.0750 XW/U = 5.0600 WT = 3.1416 (TEMPORAL DATA)

PROFILE COEFFICIENTS -0.76094 6.83340 -23.59700 51.79700 -78.09001 74.26200 -38.91500 8.48810

RE(DELTA) = 1500.

ALFAR*DELTA	BETAR*NU/U**2	BETAI*NU/U**2	CIMAG	GROUP VEL.	WAVE VEL.	ALFAI*NU/U
1.4000	0.3657E-03	-0.3099E-05	-0.0033	0.4439	0.3919	0.6981E-05
1.3000	0.3362E-03	-0.1319E-05	-0.0015	0.4439	0.3880	0.2972E-05
1.2000	0.3065E-03	-0.6999E-06	-0.0008	0.4439	0.3832	0.1576E-05
1.1000	0.2770E-03	-0.1053E-05	-0.0014	0.4440	0.3778	0.2372E-05
1.0000	0.2473E-03	-0.2499E-05	-0.0037	0.4422	0.3710	0.5653E-05
0.9000	0.2181E-03	-0.4659E-05	-0.0077	0.4375	0.3635	0.1065E-04
0.8000	0.1890E-03	-0.7646E-05	-0.0143	0.4328	0.3544	0.1766E-04
0.7000	0.1603E-03	-0.1116E-04	-0.0239	0.4281	0.3436	0.2606E-04

RE(DELTA) = 3000.

ALFAR*DELTA	BETAR*NU/U**2	BETAI*NU/U**2	CIMAG	GROUP VEL.	WAVE VEL.	ALFAI*NU/U
1.6000	0.1904E-03	-0.2053E-05	-0.0038	0.3756	0.3571	0.5466E-05
1.5000	0.1777E-03	0.1036E-05	0.0020	0.3839	0.3555	-0.2700E-05
1.4000	0.1648E-03	0.3503E-05	0.0075	0.3922	0.3533	-0.8931E-05
1.3000	0.1516E-03	0.5249E-05	0.0121	0.3977	0.3499	-0.1319E-04
1.2000	0.1383E-03	0.6263E-05	0.0156	0.3992	0.3458	-0.1568E-04
1.1000	0.1250E-03	0.6643E-05	0.0181	0.3998	0.3409	-0.1661E-04
1.0000	0.1117E-03	0.6393E-05	0.0191	0.3979	0.3351	-0.1606E-04
0.9000	0.9850E-04	0.5583E-05	0.0186	0.3941	0.3283	-0.1416E-04
0.8000	0.8542E-04	0.4173E-05	0.0156	0.3885	0.3203	-0.1074E-04
0.7000	0.7259E-04	0.2326E-05	0.0099	0.3781	0.3111	-0.6152E-05
0.6000	0.6021E-04	0.1299E-06	0.0006	0.3702	0.3010	-0.3511E-06
0.5000	0.4791E-04	-0.2143E-05	-0.0128	0.3622	0.2875	0.5916E-05

NA = 0.0750   XW/U = 5.0600   WT = 3.9270

PROFILE COEFFICIENTS -0.94197 5.11000 -6.58710 -3.56620 14.38400 -11.42100 3.03880 0.00000

RE(DELTA) = 900.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.6533	0.7777E-03	0.1299E-04	0.4868	0.4233	-0.344E-02
0.650	1.5506	0.7222E-03	0.4333E-05	0.4861	0.4191	-0.122E-02
0.600	1.4476	0.6666E-03	-0.5555E-06	0.4854	0.4144	0.167E-03
0.550	1.3446	0.6111E-03	-0.1666E-05	0.4852	0.4090	0.541E-03
0.500	1.2415	0.5555E-03	0.8888E-06	0.4849	0.4027	-0.312E-03
0.450	1.1384	0.5000E-03	0.6777E-05	0.4844	0.3952	-0.259E-02
0.400	1.0351	0.4444E-03	0.1600E-04	0.4840	0.3864	-0.673E-02

RE(DELTA) = 1000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.750	1.7792	0.7500E-03	0.1589E-04	0.4800	0.4215	-0.429E-02
0.700	1.6751	0.6999E-03	0.25[illegible]-05	0.4784	0.4178	-0.714E-03
0.650	1.5702	0.6500E-03	-0.70[illegible]-05	0.4768	0.4139	0.215E-02
0.600	1.4654	0.5999E-03	-0.[illegible]-04	0.4766	0.4094	0.416E-02
0.550	1.3604	0.5499E-03	-0.[illegible]E-04	0.4759	0.4042	0.517E-02
0.500	1.2553	0.5000E-03	-0.[illegible]E-04	0.4759	0.3983	0.500E-02
0.450	1.1503	0.4499E-03	-0.[illegible]200E-05	0.4757	0.3912	0.339E-02
0.400	1.0451	0.4000E-03	0.0000E 00	0.4746	0.3827	0.000E 00
0.350	0.9396	0.3499E-03	0.1119E-04	0.4723	0.3724	-0.563E-02
0.300	0.8334	0.2999E-03	0.2509E-04	0.4671	0.3599	-0.140E-01
0.250	0.7255	0.2500E-03	0.4149E-04	0.4567	0.3445	-0.261E-01
0.200	0.6144	0.2000E-03	0.5999E-04	0.4463	0.3255	-0.435E-01

RE(DELTA) = 1300.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.7293	0.5384E-03	-0.9615E-05	0.4622	0.4047	0.334E-02
0.650	1.6207	0.5000E-03	-0.2092E-04	0.4591	0.4010	0.770E-02
0.600	1.5115	0.4615E-03	-0.2884E-04	0.4560	0.3969	0.113E-01
0.550	1.4014	0.4230E-03	-0.3292E-04	0.4543	0.3924	0.138E-01
0.500	1.2914	0.3846E-03	-0.3376E-04	0.4543	0.3871	0.154E-01
0.450	1.1813	0.3461E-03	-0.3130E-04	0.4543	0.3809	0.156E-01
0.400	1.0713	0.3076E-03	-0.2569E-04	0.4539	0.3733	0.141E-01
0.350	0.9610	0.2692E-03	-0.1715E-04	0.4528	0.3642	0.105E-01
0.300	0.8505	0.2307E-03	-0.5846E-05	0.4502	0.3527	0.402E-02
0.250	0.7389	0.1923E-03	0.7923E-05	0.4436	0.3383	-0.618E-02
0.200	0.6251	0.1538E-03	0.2376E-04	0.4297	0.3199	-0.212E-01
0.150	0.5061	0.1153E-03	0.4138E-04	0.4158	0.2963	-0.442E-01

RE(DELTA) = 2000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.8139	0.3499E-03	-0.3350E-05	0.4521	0.3859	0.167E-02
0.650	1.7024	0.3250E-03	-0.1694E-04	0.4431	0.3818	0.882E-02
0.600	1.5882	0.2999E-03	-0.2759E-04	0.4340	0.3777	0.150E-01
0.550	1.4720	0.2749E-03	-0.3509E-04	0.4286	0.3736	0.204E-01
0.500	1.3549	0.2500E-03	-0.3945E-04	0.4253	0.3690	0.247E-01
0.450	1.2369	0.2249E-03	-0.4330E-04	0.4231	0.3638	0.296E-01
0.400	1.1186	0.2000E-03	-0.3925E-04	0.4221	0.3575	0.296E-01
0.350	1.0000	0.1749E-03	-0.3489E-04	0.4214	0.3500	0.294E-01
0.300	0.8813	0.1499E-03	-0.2790E-04	0.4203	0.3404	0.266E-01
0.250	0.7621	0.1250E-03	-0.1840E-04	0.4178	0.3280	0.201E-01
0.200	0.6420	0.1000E-03	-0.6700E-05	0.4110	0.3115	0.858E-02
0.150	0.5188	0.7499E-04	0.6799E-05	0.3924	0.2891	-0.102E-01
0.100	0.3869	0.5000E-04	0.2165E-04	0.3738	0.2584	-0.419E-01

RE(DELTA) = 3000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.7618	0.2166E-03	-0.2433E-05	0.4596	0.3689	0.190E-02
0.600	1.6509	0.1999E-03	-0.1369E-04	0.4416	0.3634	0.109E-01
0.550	1.5353	0.1833E-03	-0.2306E-04	0.4237	0.3582	0.190E-01
0.500	1.4148	0.1666E-03	-0.2963E-04	0.4113	0.3534	0.258E-01
0.450	1.2922	0.1500E-03	-0.3376E-04	0.4040	0.3482	0.316E-01
0.400	1.1673	0.1333E-03	-0.3529E-04	0.3987	0.3426	0.361E-01
0.350	1.0414	0.1166E-03	-0.3430E-04	0.3957	0.3360	0.391E-01
0.300	0.9146	0.9999E-04	-0.3086E-04	0.3937	0.3280	0.398E-01
0.250	0.7874	0.8333E-04	-0.2503E-04	0.3920	0.3175	0.373E-01
0.200	0.6595	0.6666E-04	-0.1696E-04	0.3885	0.3032	0.299E-01
0.150	0.5300	0.4999E-04	-0.6933E-05	0.3850	0.2830	0.151E-01

NA = 0.0750   XW/U = 5.0600   WT = 3.9270

RE(DELTA) = 5250.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.7729	0.1238E-03	0.7352E-05	0.5591	0.3666	-0.121E-01
0.600	1.6802	0.1142E-03	0.7428E-06	0.5209	0.3571	-0.120E-02
0.550	1.5807	0.1047E-03	-0.5923E-05	0.4827	0.3479	0.949E-02
0.500	1.4727	0.9523E-04	-0.1220E-04	0.4455	0.3395	0.193E-01
0.450	1.3559	0.8571E-04	-0.1752E-04	0.4148	0.3318	0.281E-01
0.400	1.2314	0.7619E-04	-0.2139E-04	0.3929	0.3248	0.358E-01
0.350	1.1013	0.6666E-04	-0.2339E-04	0.3772	0.3178	0.420E-01
0.300	0.9662	0.5714E-04	-0.2361E-04	0.3668	0.3104	0.470E-01
0.250	0.8287	0.4761E-04	-0.2173E-04	0.3610	0.3016	0.497E-01
0.200	0.6892	0.3809E-04	-0.1790E-04	0.3566	0.2901	0.486E-01
0.150	0.5483	0.2857E-04	-0.1201E-04	0.3510	0.2735	0.403E-01
0.100	0.4043	0.1904E-04	-0.4514E-05	0.3316	0.2473	0.194E-01
0.050	0.2461	0.9523E-05	0.4114E-05	0.3122	0.2031	-0.274E-01

RE(DELTA) = 7250.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.7701	0.8965E-04	0.5379E-05	0.5631	0.3672	-0.124E-01
0.550	1.5805	0.7586E-04	-0.2441E-05	0.5091	0.3479	0.570E-02
0.500	1.4805	0.6896E-04	-0.6262F-05	0.4821	0.3377	0.147E-01
0.450	1.3728	0.6206E-04	-0.1031E-04	0.4461	0.3277	0.243E-01
0.400	1.2560	0.5517E-04	-0.1384E-04	0.4121	0.3184	0.329E-01
0.350	1.1298	0.4827E-04	-0.1652E-04	0.3838	0.3097	0.407E-01
0.300	0.9952	0.4137E-04	-0.1783E-04	0.3632	0.3014	0.472E-01
0.250	0.8544	0.3448E-04	-0.1753E-04	0.3498	0.2926	0.520E-01
0.200	0.7093	0.2758E-04	-0.1546E-04	0.3415	0.2819	0.539E-01
0.150	0.5616	0.2068E-04	-0.1155F-04	0.3349	0.2670	0.499E-01
0.100	0.4107	0.1379E-04	-0.5944E-05	0.3206	0.2434	0.336E-01
0.050	0.2494	0.6896E-05	0.8827E-06	0.3063	0.2004	-0.786E-02

NA = 0.0750   XW/U = 5.0600   WT = 4.7124

PROFILE COEFFICIENTS -0.55041 -0.00106 18.14100 -66.40400 107.82000 -93.52801 42.58300 -8.04470

RE(DELTA) = 700.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.750	1.6644	0.1071E-02	0.2614E-04	0.5243	0.4506	-0.576E-02
0.700	1.5690	0.9999E-03	0.1771E-04	0.5237	0.4461	-0.413E-02
0.650	1.4733	0.9285E-03	0.1300E-04	0.5221	0.4411	-0.322E-02
0.600	1.3775	0.8571E-03	0.1228E-04	0.5213	0.4355	-0.325E-02
0.550	1.2815	0.7857E-03	0.1514E-04	0.5205	0.4291	-0.430E-02
0.500	1.1854	0.7142E-03	0.2171E-04	0.5194	0.4217	-0.666E-02
0.450	1.0890	0.6428E-03	0.3142E-04	0.5173	0.4132	-0.104E-01
0.400	0.9921	0.5714E-03	0.4442E-04	0.5151	0.4031	-0.161E-01

RE(DELTA) = 850.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.750	1.6996	0.8823E-03	-0.1176E-05	0.5114	0.4412	0.300E-03
0.700	1.6015	0.8235E-03	-0.1082E-04	0.5089	0.4370	0.292E-02
0.650	1.5031	0.7647E-03	-0.1694E-04	0.5063	0.4324	0.485E-02
0.600	1.4040	0.7058E-03	-0.1941E-04	0.5047	0.4273	0.593E-02
0.550	1.3050	0.6470E-03	-0.1835E-04	0.5042	0.4214	0.602E-02
0.500	1.2057	0.5882E-03	-0.1388E-04	0.5035	0.4146	0.492E-02
0.450	1.1064	0.5294E-03	-0.6000E-05	0.5027	0.4067	0.231E-02

RE(DELTA) = 1400.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.800	1.8896	0.5714E-03	0.1571E-05	0.4975	0.4233	-0.579E-03
0.750	1.7885	0.5357E-03	-0.1449E-04	0.4902	0.4193	0.556E-02
0.700	1.6856	0.4999E-03	-0.2742E-04	0.4828	0.4152	0.110E-01
0.650	1.5814	0.4642E-03	-0.3700E-04	0.4764	0.4110	0.156E-01
0.600	1.4757	0.4285E-03	-0.4371E-04	0.4719	0.4065	0.195E-01
0.550	1.3695	0.3928E-03	-0.4721E-04	0.4690	0.4016	0.226E-01
0.500	1.2625	0.3571E-03	-0.4764E-04	0.4666	0.3960	0.246E-01
0.450	1.1552	0.3214E-03	-0.4507E-04	0.4653	0.3895	0.254E-01
0.400	1.0476	0.2857E-03	-0.3957E-04	0.4638	0.3818	0.245E-01
0.350	0.9396	0.2499E-03	-0.3135E-04	0.4621	0.3724	0.215E-01
0.300	0.8312	0.2142E-03	-0.2049E-04	0.4591	0.3609	0.158E-01
0.250	0.7218	0.1785E-03	-0.7285E-05	0.4529	0.3463	0.640E-02

NA = 0.0750   XW/U = 5.0600   WT = 4.7124

RE(DELTA) = 1400.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.200	0.6104	0.1428E-03	0.8000E-05	0.4399	0.3276	-0.807E-02
0.150	0.4944	0.1071E-03	0.2485E-04	0.4269	0.3033	-0.300E-01

RE(DELTA) = 2000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.750	1.8386	0.3750E-03	-0.2350E-05	0.5047	0.4079	0.129E-02
0.700	1.7378	0.3499E-03	-0.1580E-04	0.4888	0.4028	0.888E-02
0.650	1.6340	0.3250E-03	-0.2719E-04	0.4729	0.3977	0.157E-01
0.600	1.5263	0.2999E-03	-0.3574E-04	0.4610	0.3931	0.215E-01
0.550	1.4171	0.2749E-03	-0.4175E-04	0.4537	0.3881	0.267E-01
0.500	1.3059	0.2500E-03	-0.4505E-04	0.4478	0.3828	0.308E-01
0.450	1.1938	0.2249E-03	-0.4564E-04	0.4438	0.3769	0.339E-01
0.400	1.0806	0.2000E-03	-0.4364E-04	0.4407	0.3701	0.356E-01
0.350	0.9669	0.1749E-03	-0.3904E-04	0.4384	0.3619	0.354E-01
0.300	0.8525	0.1499E-03	-0.3200E-04	0.4359	0.3519	0.327E-01
0.250	0.7375	0.1250E-03	-0.2250E-04	0.4321	0.3389	0.263E-01
0.200	0.6211	0.1000E-03	-0.1094E-04	0.4243	0.3220	0.149E-01
0.150	0.5018	0.7499E-04	0.2350E-05	0.4164	0.2989	-0.390E-02

RE(DELTA) = 3000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.7687	0.2333E-03	-0.1333E-05	0.5346	0.3957	0.120E-02
0.650	1.6728	0.2166E-03	-0.1100E-04	0.5069	0.3885	0.100E-01
0.600	1.5713	0.1999E-03	-0.1983E-04	0.4792	0.3818	0.181E-01
0.550	1.4640	0.1833E-03	-0.2693E-04	0.4578	0.3756	0.252E-01
0.500	1.3528	0.1666E-03	-0.3223E-04	0.4425	0.3696	0.316E-01
0.450	1.2380	0.1500E-03	-0.3546E-04	0.4308	0.3634	0.370E-01
0.400	1.1207	0.1333E-03	-0.3650E-04	0.4225	0.3569	0.412E-01
0.350	1.0013	0.1166E-03	-0.3529E-04	0.4163	0.3495	0.440E-01
0.300	0.8805	0.9999E-04	-0.3183E-04	0.4120	0.3407	0.446E-01
0.250	0.7586	0.8333E-04	-0.2613E-04	0.4081	0.3295	0.421E-01
0.200	0.6355	0.6666E-04	-0.1833E-04	0.4027	0.3147	0.348E-01
0.150	0.5103	0.4999E-04	-0.8666E-05	0.3909	0.2939	0.199E-01
0.100	0.3796	0.3333E-04	0.2366E-05	0.3791	0.2634	-0.709E-02

RE(DELTA) = 5250.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.750	1.8529	0.1428E-03	0.6552E-05	0.5962	0.4047	-0.110E-01
0.650	1.6773	0.1238E-03	-0.2000E-05	0.5545	0.3875	0.347E-02
0.600	1.5959	0.1142E-03	-0.6247E-05	0.5336	0.3783	0.110E-01
0.400	1.1693	0.7619E-04	-0.2120E-04	0.4285	0.3420	0.407E-01
0.350	1.0490	0.6666E-04	-0.2264E-04	0.4065	0.3336	0.460E-01
0.300	0.9232	0.5714E-04	-0.2274E-04	0.3914	0.3249	0.506E-01
0.250	0.7935	0.4761E-04	-0.2095E-04	0.3814	0.3150	0.528E-01
0.200	0.6610	0.3809E-04	-0.1739E-04	0.3734	0.3025	0.515E-01
0.150	0.5257	0.2857E-04	-0.1186E-04	0.3650	0.2853	0.432E-01
0.100	0.3870	0.1904E-04	-0.4838E-05	0.3432	0.2583	0.225E-01
0.050	0.2336	0.9523E-05	0.3257E-05	0.3214	0.2140	-0.235E-01

RE(DELTA) = 7250.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.750	1.8586	0.1034E-03	0.4275E-05	0.5675	0.4035	-0.946E-02
0.700	1.7691	0.9655E-04	0.1144E-05	0.5552	0.3956	-0.260E-02
0.650	1.6785	0.8965E-04	-0.1862E-05	0.5430	0.3872	0.436E-02
0.600	1.5849	0.8275E-04	-0.4413E-05	0.5305	0.3785	0.107E-01
0.550	1.4900	0.7586E-04	-0.6910E-05	0.5222	0.3691	0.175E-01
0.500	1.3934	0.6896E-04	-0.9227E-05	0.5051	0.3588	0.242E-01
0.450	1.2919	0.6206E-04	-0.1164E-04	0.4792	0.3483	0.313E-01
0.400	1.1846	0.5517E-04	-0.1397E-04	0.4494	0.3376	0.384E-01
0.350	1.0691	0.4827E-04	-0.1580E-04	0.4190	0.3273	0.449E-01
0.300	0.9457	0.4137E-04	-0.1673E-04	0.3935	0.3172	0.504E-01
0.250	0.8148	0.3448E-04	-0.1640E-04	0.3741	0.3068	0.545E-01
0.200	0.6783	0.2758E-04	-0.1451E-04	0.3605	0.2948	0.559E-01
0.150	0.5374	0.2068E-04	-0.1097E-04	0.3499	0.2791	0.518E-01
0.100	0.3925	0.1379E-04	-0.5765E-05	0.3324	0.2547	0.354E-01
0.050	0.2362	0.6896E-05	0.5379E-06	0.3149	0.2116	-0.520E-02

NA = 0.0750 XW/U = 5.0600 WT = 5.4978

PROFILE COEFFICIENTS 0.18028 -5.10600 32.48000 -85.42401 116.88000 -88.64801 35.57201 -5.91220

RE(DELTA) = 800.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.4941	0.8750E-03	0.1587E-04	0.5741	0.4685	-0.488E-02
0.650	1.4074	0.8125E-03	0.1474E-04	0.5551	0.4618	-0.465E-02
0.600	1.3137	0.7499E-03	0.9875E-05	0.5362	0.4567	-0.322E-02
0.550	1.2209	0.6874E-03	0.1212E-04	0.5387	0.4504	-0.428E-02
0.500	1.1281	0.6250E-03	0.1512E-04	0.5396	0.4432	-0.578E-02
0.450	1.0356	0.5625E-03	0.2337E-04	0.5367	0.4345	-0.969E-02
0.400	0.9418	0.5000E-03	0.3212E-04	0.5339	0.4247	-0.145E-01

RE(DELTA) = 900.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.5418	0.7777E-03	0.6444E-05	0.4099	0.4540	-0.154E-02
0.650	1.4194	0.7222E-03	0.6666E-06	0.4730	0.4579	-0.199E-03
0.600	1.3264	0.6666E-03	-0.2222E-05	0.5361	0.4523	0.808E-03
0.550	1.2329	0.6111E-03	-0.2222E-05	0.5336	0.4461	0.865E-03
0.500	1.1390	0.5555E-03	0.7777E-06	0.5310	0.4389	-0.326E-03
0.450	1.0446	0.5000E-03	0.6555E-05	0.5285	0.4307	-0.298E-02

RE(DELTA) = 1000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.4322	0.6500E-03	-0.6499E-05	0.5397	0.4538	0.244E-02
0.600	1.3389	0.5999E-03	-0.1039E-04	0.5330	0.4481	0.414E-02
0.550	1.2446	0.5499E-03	-0.1130E-04	0.5263	0.4419	0.477E-02
0.500	1.1489	0.5000E-03	-0.9400E-05	0.5224	0.4351	0.427E-02
0.450	1.0532	0.4499E-03	-0.4600E-05	0.5203	0.4272	0.227E-02
0.400	0.9567	0.4000E-03	0.2699E-05	0.5170	0.4181	-0.145E-02
0.350	0.8598	0.3499E-03	0.1239E-04	0.5120	0.4070	-0.738E-02
0.300	0.7614	0.2999E-03	0.2429E-04	0.5038	0.3940	-0.160E-01
0.250	0.6613	0.2500E-03	0.3789E-04	0.4903	0.3780	-0.281E-01
0.200	0.5574	0.2000E-03	0.5310E-04	0.4672	0.3588	-0.445E-01
0.150	0.4471	0.1499E-03	0.6940E-04	0.4441	0.3354	-0.689E-01

RE(DELTA) = 1400.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.5720	0.4999E-03	-0.5142E-05	0.5270	0.4452	0.241E-02
0.650	1.4767	0.4642E-03	-0.1378E-04	0.5195	0.4401	0.679E-02
0.600	1.3795	0.4285E-03	-0.2028E-04	0.5120	0.4349	0.105E-01
0.550	1.2814	0.3928E-03	-0.2392E-04	0.5068	0.4292	0.132E-01
0.500	1.1822	0.3571E-03	-0.2499E-04	0.5022	0.4229	0.148E-01
0.450	1.0823	0.3214E-03	-0.2335E-04	0.4985	0.4157	0.150E-01
0.400	0.9816	0.2857E-03	-0.1935E-04	0.4945	0.4074	0.136E-01
0.350	0.8801	0.2499E-03	-0.1292E-04	0.4904	0.3976	0.100E-01
0.300	0.7777	0.2142E-03	-0.4357E-05	0.4847	0.3857	0.380E-02
0.250	0.6738	0.1785E-03	0.6214E-05	0.4755	0.3710	-0.614E-02
0.200	0.5674	0.1428E-03	0.1828E-04	0.4589	0.3524	-0.207E-01
0.150	0.4558	0.1071E-03	0.3135E-04	0.4423	0.3290	-0.426E-01

RE(DELTA) = 2000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.6114	0.3499E-03	0.3050E-05	0.5413	0.4344	-0.204E-02
0.650	1.5177	0.3250E-03	-0.7050E-05	0.5253	0.4232	0.488E-02
0.600	1.4210	0.2999E-03	-0.1495E-04	0.5092	0.4222	0.107E-01
0.550	1.3213	0.2749E-03	-0.2099E-04	0.4960	0.4162	0.157E-01
0.500	1.2194	0.2500E-03	-0.2460E-04	0.4868	0.4100	0.196E-01
0.450	1.1159	0.2249E-03	-0.2604E-04	0.4796	0.4032	0.223E-01
0.400	1.0109	0.2000E-03	-0.2505E-04	0.4735	0.3956	0.234E-01
0.350	0.9047	0.1749E-03	-0.2184E-04	0.4681	0.3868	0.226E-01
0.300	0.7973	0.1499E-03	-0.1650E-04	0.4629	0.3762	0.191E-01
0.250	0.6887	0.1250E-03	-0.9149E-05	0.4564	0.3630	0.121E-01
0.200	0.5782	0.1000E-03	-0.4999E-07	0.4449	0.3459	0.769E-04
0.150	0.4639	0.7499E-04	0.1024E-04	0.4334	0.3233	-0.191E-01

RE(DELTA) = 5250.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.6119	0.1333E-03	0.8590E-05	0.6294	0.4342	-0.176E-01
0.650	1.5318	0.1238E-03	0.5904E-05	0.6203	0.4243	-0.125E-01
0.600	1.4507	0.1142E-03	0.3142E-05	0.6112	0.4135	-0.[illegible]E-02
0.550	1.3682	0.1047E-03	0.1333E-06	0.5917	0.4019	-0.30[illegible]E-03

NA = 0.0750   XW/U = 5.0600   WT = 5.4978

RE(DELTA) = 5250.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.500	1.2816	0.9523E-04	-0.3276E-05	0.5622	0.3901	0.754E-02
0.450	1.1902	0.8571E-04	-0.6647E-05	0.5174	0.3780	0.151E-01
0.400	1.0877	0.7619E-04	-0.9934E-05	0.4732	0.3677	0.226E-01
0.350	0.9787	0.6666E-04	-0.1111E-04	0.4463	0.3576	0.290E-01
0.300	0.8635	0.5714E-04	-0.1293E-04	0.4250	0.3474	0.334E-01
0.250	0.7433	0.4761E-04	-0.1205E-04	0.4083	0.3363	0.347E-01
0.200	0.6185	0.3809E-04	0.[illegible]752E-05	0.[illegible]7	0.3233	0.327E-01
0.150	0.4906	0.2857E-04	-0.5657[illegible]05	[illegible]	0.3057	0.231E-01
0.100	0.3571	0.1904E-04	-0.4[illegible]1E-06	0.[illegible]6	0.2800	0.248E-02
0.050	0.2086	0.9523E-05	0.5295E-05	0.3285	0.2396	-0.437E-01

RE(DELTA) = 7250.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.6132	0.9655E-04	0.5558E-05	0.6020	0.4339	-0.190E-01
0.650	1.5300	0.8965E-04	0.3724E-05	0.5973	0.4248	-0.105E-01
0.600	1.4458	0.8275E-04	0.1958E-05	0.5927	0.4149	-0.582E-02
0.550	1.3613	0.7586E-04	0.4551E-06	0.5879	0.4040	-0.142E-02
0.500	1.2757	0.6896E-04	-0.1117E-05	0.5780	0.3919	0.367E-02
0.450	1.1883	0.6206E-04	-0.2868E-05	0.5571	0.3786	0.975E-02
0.400	1.0961	0.5517E-04	-0.4937E-05	0.5189	0.3649	0.169E-01
0.350	0.9952	0.4827E-04	-0.7062E-05	0.4729	0.3516	0.243E-01
0.300	0.8842	0.4137E-04	-0.8662E-05	0.4328	0.3392	0.307E-01
0.250	0.7638	0.3448E-04	-0.9158E-05	0.4035	0.3273	0.350E-01
0.200	0.6362	0.2758E-04	-0.8248E-05	0.3836	0.3143	0.360E-01
0.150	0.5030	0.2068E-04	-0.5806E-05	0.3681	0.2982	0.308E-01
0.100	0.3645	0.1379E-04	-0.1944E-05	0.3446	0.2743	0.133E-01
0.050	0.2122	0.6896E-05	0.2510E-05	0.3211	0.2356	-0.275E-01

NA = 0.0750 XW/U = 9.0000 WT = 0.0000

PROFILE COEFFICIENTS 1.11190 -12.16400 59.33500-146.50003 201.53002-158.33001 66.82301 -11.79200

RE(DELTA) = 1000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.3502	0.6500E-03	0.1730E-04	0.5691	0.4814	-0.729E-02
0.600	1.2621	0.5999E-03	0.1499E-04	0.5643	0.4753	-0.670E-02
0.550	1.1730	0.5499E-03	0.1499E-04	0.5596	0.4688	-0.715E-02
0.500	1.0834	0.5000E-03	0.1720E-04	0.5555	0.4615	-0.882E-02
0.450	0.9930	0.4499E-03	0.2150E-04	0.5509	0.4531	-0.119E-01
0.400	0.9019	0.4000E-03	0.2759E-04	0.5452	0.4435	-0.166E-01
0.350	0.8096	0.3499E-03	0.3550E-04	0.5373	0.4323	-0.235E-01
0.300	0.7158	0.2999E-03	0.4479E-04	0.5258	0.4191	-0.329E-01
0.250	0.6194	0.2500E-03	0.5529E-04	0.5083	0.4036	-0.453E-01
0.200	0.5190	0.2000E-03	0.6649E-04	0.4908	0.3853	-0.628E-01

RE(DELTA) = 2000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.750	1.5903	0.3750E-03	0.2170E-04	0.6019	0.4716	-0.164E-01
0.700	1.5059	0.3499E-03	0.1334E-04	0.5832	0.4648	-0.103E-01
0.650	1.4188	0.3250E-03	0.5349E-05	0.5644	0.4581	-0.425E-02
0.600	1.3287	0.2999E-03	-0.6000E-06	0.5483	0.4515	0.495E-03
0.550	1.2364	0.2749E-03	-0.5150E-05	0.5342	0.4448	0.445E-02
0.500	1.1415	0.2500E-03	-0.7650E-05	0.5230	0.4380	0.701E-02
0.450	1.0452	0.2249E-03	-0.8650E-05	0.5141	0.4305	0.851E-02
0.400	0.9470	0.2000E-03	-0.7599E-05	0.5065	0.4223	0.813E-02
0.350	0.8478	0.1749E-03	-0.5099E-05	0.4992	0.4128	0.600E-02
0.300	0.7467	0.1499E-03	-0.6999E-06	0.4919	0.4017	0.922E-03

RE(DELTA) = 3000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.3542	0.1999E-03	0.6000E-05	0.5784	0.4430	-0.768E-02
0.550	1.2661	0.1833E-03	0.7666E-06	0.5537	0.4344	-0.100E-02
0.500	1.1735	0.1666E-03	-0.3466E-05	0.5290	0.4260	0.468E-02
0.450	1.0770	0.1500E-03	-0.6366E-05	0.5093	0.4178	0.903E-02
0.400	0.9771	0.1333E-03	-0.7866E-05	0.4936	0.4093	0.119E-01
0.350	0.8744	0.1166E-03	-0.7733E-05	0.4812	0.4002	0.127E-01
0.300	0.7693	0.9999E-04	-0.6133E-05	0.4708	0.3899	0.112E-01
0.250	0.6620	0.8333E-04	-0.2933E-05	0.4608	0.3776	0.612E-02
0.200	0.5523	0.6666E-04	0.1500E-05	0.4483	0.3621	-0.365E-02
0.150	0.4389	0.4999E-04	0.6899E-05	0.4262	0.3417	-0.201E-01
0.100	0.3174	0.3333E-04	0.1223E-04	0.4040	0.3150	-0.467E-01

RE(DELTA) = 5450.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.4195	0.1192E-03	0.9321E-05	0.6555	0.4579	-0.234E-01
0.600	1.3418	0.1100E-03	0.7944E-05	0.6502	0.4471	-0.209E-01
0.550	1.2657	0.1009E-03	0.6403E-05	0.6449	0.4345	-0.177E-01
0.500	1.1867	0.9174E-04	0.4256E-05	0.6162	0.4213	-0.120E-01
0.450	1.1033	0.8256E-04	0.1779E-05	0.5747	0.4078	-0.505E-02
0.400	1.0124	0.7339E-04	-0.9908E-06	0.5270	0.3951	0.281E-02
0.350	0.9132	0.6422E-04	-0.3027E-05	0.4871	0.3832	0.880E-02
0.300	0.8069	0.5504E-04	-0.4256E-05	0.4572	0.3717	0.131E-01
0.250	0.6943	0.4587E-04	-0.4018E-05	0.4362	0.3600	0.137E-01
0.200	0.5776	0.3669E-04	-0.2642E-05	0.4203	0.3462	0.104E-01
0.150	0.4563	0.2752E-04	0.2385E-06	0.4027	0.3287	-0.114E-02
0.100	0.3292	0.1834E-04	0.3467E-05	0.3709	0.3037	-0.212E-01
0.050	0.1857	0.9174E-05	0.6495E-05	0.3390	0.2692	-0.646E-01

RE(DELTA) = 7000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.4151	0.9285E-04	0.6542E-05	0.6273	0.4593	-0.203E-01
0.600	1.3354	0.8571E-04	0.5714E-05	0.6297	0.4493	-0.188E-01
0.550	1.2563	0.7857E-04	0.4985E-05	0.6321	0.4377	-0.175E-01
0.500	1.1772	0.7142E-04	0.4228E-05	0.6301	0.4247	-0.158E-01
0.450	1.0976	0.6428E-04	0.3142E-05	0.6149	0.4099	-0.123E-01
0.400	1.0145	0.5714E-04	0.1457E-05	0.5731	0.3942	-0.576E-02
0.350	0.9227	0.4999E-04	-0.5142E-06	0.5174	0.3793	0.201E-02
0.300	0.8207	0.4285E-04	-0.2228E-05	0.4689	0.3655	0.891E-02
0.250	0.7090	0.3571E-04	-0.2957E-05	0.4344	0.3526	0.126E-01
0.200	0.5903	0.2857E-04	-0.2428E-05	0.4107	0.3388	0.118E-01
0.150	0.4654	0.2142E-04	-0.7428E-06	0.3918	0.3223	0.437E-02
0.100	0.3350	0.1428E-04	0.1985E-05	0.2437	0.2985	-0.101E-01

NA = 0.0750 XW/U = 9.0000 WT = 1.5708

PROFILE COEFFICIENTS 0.59405 -0.04224 -21.43800 110.47000-248.35000 286.44000-166.16000 38.50400

RE(DELTA) = 5450.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.8866	0.1100E-03	0.8829E-04	0.2369	0.3180	-0.604E-01
0.550	1.6839	0.1009E-03	0.7445E-04	0.2511	0.3266	-0.605E-01
0.500	1.4883	0.9174E-04	0.6042E-04	0.2653	0.3359	-0.587E-01
0.450	1.3065	0.8256E-04	0.4656E-04	0.2905	0.3444	-0.564E-01
0.400	1.1431	0.7339E-04	0.3319E-04	0.3269	0.3499	-0.517E-01
0.350	0.9994	0.6422E-04	0.2269E-04	0.3594	0.3502	-0.444E-01
0.300	0.8646	0.5504E-04	0.1552E-04	0.3762	0.3469	-0.368E-01
0.250	0.7336	0.4587E-04	0.1194E-04	0.3838	0.3407	-0.340E-01
0.200	0.6041	0.3669E-04	0.1029E-04	0.3834	0.3310	-0.356E-01
0.150	0.4728	0.2752E-04	0.1091E-04	0.3830	0.3172	-0.482E-01

RE(DELTA) = 7000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	2.0696	0.8571E-04	0.7474E-04	0.2195	0.2899	-0.555E-01
0.550	1.8480	0.7857E-04	0.6321E-04	0.2297	0.2976	-0.550E-01
0.500	1.6342	0.7142E-04	0.5207E-04	0.2399	0.3059	-0.535E-01
0.450	1.4309	0.6428E-04	0.4112E-04	0.2553	0.3144	-0.513E-01
0.400	1.2420	0.5714E-04	0.3057E-04	0.2792	0.3220	-0.481E-01
0.350	1.0718	0.4999E-04	0.2115E-04	0.3096	0.3265	-0.427E-01
0. 00	0.9182	0.4285E-04	0.1399E-04	0.3366	0.3267	-0.359E-01
0.250	0.7744	0.3571E-04	0.9671E-05	0.3515	0.3228	-0.307E-01
0.200	0.6337	0.2857E-04	0.7671E-05	0.3559	0.3156	-0.301E-01
0.150	0.4935	0.2142E-04	0.7657E-05	0.3536	0.3039	-0.384E-01
0.100	0.3509	0.1428E-04	0.8614E-05	0.3512	0.2849	-0.603E-01

RE(DELTA) = 10000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.300	1.0103	0.2999E-04	0.1194E-04	0.2924	0.2969	-0.345E-01
0.250	0.8399	0.2500E-04	0.7499E-05	0.3056	0.2976	-0.272E-01
0.200	0.6826	0.1999E-04	0.4999E-05	0.3188	0.2929	-0.233E-01
0.150	0.5263	0.1499E-04	0.4540E-05	0.3227	0.2850	-0.278E-01
0.100	0.3727	0.9999E-05	0.5249E-05	0.3122	0.2683	-0.439E-01
0.050	0.2055	0.4999E-05	0.5970E-05	0.3018	0.2433	-0.876E-01

'IA = 0.0750 XW/U = 9.0000 WT = 1.5708 (HIGHER MODE SOLUTIONS)

PROFILE COEFFICIENTS 0.59405 -0.04224 -21.43800 110.47000-248.35000 286.44000-166.16000 38.50400

RE(DELTA) = 5450.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.2165	0.1192E-03	0.3447E-04	0.6866	0.5343	-0.106E 00
0.600	1.1421	0.1100E-03	0.3478E-04	0.6532	0.5253	-0.108E 00
0.550	1.0633	0.1009E-03	0.3599E-04	0.6199	0.5172	-0.114E 00
0.500	0.9807	0.9174E-04	0.3787E-04	0.5779	0.5098	-0.121E 00
0.450	0.8899	0.8256E-04	0.4080E-04	0.5131	0.5056	-0.128E 00
0.400	0.7848	0.7339E-04	0.4407E-04	0.4470	0.5096	-0.136E 00
0.350	0.6653	0.6422E-04	0.4555E-04	0.4117	0.5260	-0.153E 00
0.300	0.54[illegible]9	0.5504E-04	0.4447E-04	0.4098	0.5536	-0.183E 00
0.250	0.4213	0.4587E-04	0.4165E-04	0.4420	0.5934	-0.238E 00
0.200	0.3148	0.3669E-04	0.4078E-04	0.6827	0.6353	-0.482E 00
0.150	0.2590	0.2752E-04	0.4682E-04	2.4321	0.5791	-0.239E 01
0.100	0.2464	0.1834E-04	0.3438E-04	[illegible].3448	0.4058	-0.178E 01
0.050	0.1771	0.9174E-05	0.1143E-04	2.2576	0.2823	-0.794E 00

RE(DELTA) = 7000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.2904	0.9999E-04	0.2674E-04	0.7300	0.5424	-0.105E 00
0.650	1.2209	0.9285E-04	0.2644E-04	0.6975	0.5323	-0.105E 00
0.600	1.146[illegible]	0.[illegible]571E-04	0.2644E-04	0.6650	0.5231	-0.107E 00
0.550	1.0705	0.7857E-04	0.2655E-04	0.6347	0.5137	-0.110E 00
0.500	0.9892	0.7142E-04	0.2718E-04	0.5948	0.5054	-0.114E 00
0.450	0.9022	0.6428E-04	0.2829E-04	0.5466	0.4987	-0.120E 00
0.400	0.805	0.5714E-04	0.2994E-04	0.4857	0.4964	-0.126E 00
0.350	0.695[illegible]	0.4999E-04	0.3140E-04	0.4335	0.5033	-0.137E 00
0.300	0.5747	0.4285E-04	0.3140E-04	0.4108	0.5220	-0.157E 00
0.250	0.4520	0.3571E-04	0.2958E-04	0.4131	0.5530	-0.189E 00
0.200	0.3326	0.2857E-04	0.2658E-04	0.4921	0.6013	-0.275E 00
0.150	0.2442	0.2142E-04	0.2540E-04	0.0491	0.6142	-0.357E-01
0.100	0.3512	0.1428E-04	0.8642E-05	-0.0800	0.2847	0.137E-01
0.050	0.1884	0.7142E-05	0.8885E-05	-0.2093	0.2653	0.691E-01

RE(DELTA) = 10000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.2186	0.6500E-04	0.1885E-04	0.7302	0.5333	-0.113E 00
0.600	1.1491	0.599[illegible]E-04	0.1876E-04	0.7017	0.5221	-0.114E 00
0.550	1.0760	0.5499E-04	0.1867E-04	0.6731	0.5111	-0.116E 00
0.500	1.0005	0.5000E-04	0.1867E-04	0.6337	0.4997	-0.118E 00
0.450	0.9179	0.4500E-04	0.1876E-04	0.5823	0.4902	-0.119E 00
0.400	0.8285	0.3999E-04	0.1912E-04	0.5266	0.4828	-0.121E 00
0.350	0.7273	0.3499E-04	0.1966E-04	0.4649	0.4812	-0.125E 00
0.300	0.6126	0.2999E-04	0.1986E-04	0.4225	0.4897	-0.136E 00
0.250	0.4904	0.2500E-04	0.1904E-04	0.4098	0.5097	-0.159E 00
0.200	0.3686	0.1999E-04	0.1698E-04	0.4123	0.5425	-0.189E 00
0.150	0.2479	0.1499E-04	0.1413E-04	0.0246	0.6050	-0.140E-01
0.100	0.3849	0.9999E-05	0.1290E-05	-0.0431	0.259[illegible]	0.144E-02
0.050	0.2055	0.4999E-05	0.5970E-05	-0.1109	0.2433	0.322E-01

NA = 0.0750   XW/U = 9.0000   WT = 3.1416

PROFILE COEFFICIENTS -1.12980 12.16300 -54.74400 143.82000-229.30001 215.01001-108.53001 22.73000

RE(DELTA) = 1500.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.500	1.3127	0.3333E-03	0.2746E-04	0.4306	0.3808	-0.135E-01
0.450	1.1962	0.3000E-03	0.2266E-04	0.4304	0.3761	-0.122E-01
0.400	1.0804	0.2666E-03	0.2113E-04	0.4302	0.3702	-0.126E-01
0.350	0.9638	0.2333E-03	0.2306E-04	0.4301	0.3631	-0.154E-01
0.300	0.8479	0.1999E-03	0.2766E-04	0.4295	0.3538	-0.210E-01
0.250	0.7310	0.1666E-03	0.3499E-04	0.4239	0.3419	-0.304E-01
0.200	0.6120	0.1333E-03	0.4406E-04	0.4105	0.3267	-0.443E-01
0.150	0.4873	0.9999E-04	0.5479E-04	0.3815	0.3078	-0.643E-01
0.100	0.3492	0.6666E-04	0.6626E-04	0.3226	0.2863	-0.918E-01
0.050	0.1727	0.3333E-04	0.7733E-04	0.2638	0.2895	-0.177E 00

RE(DELTA) = 2100.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.500	1.3908	0.2380E-03	0.1085E-04	0.3949	0.3595	-0.647E-02
0.450	1.2641	0.2142E-03	0.3999E-05	0.3962	0.3559	-0.263E-02
0.400	1.1384	0.1904E-03	0.7142E-06	0.3974	0.3513	-0.523E-03
0.350	1.0125	0.1666E-03	0.8095E-06	0.3992	0.3456	-0.670E-03
0.300	0.8879	0.1428E-03	0.3666E-05	0.4009	0.3378	-0.347E-02
0.250	0.7631	0.1190E-03	0.9190E-05	0.3996	0.3276	-0.101E-01
0.200	0.6377	0.9523E-04	0.1676E-04	0.3984	0.3136	-0.219E-01

RE(DELTA) = 3000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.6188	0.1833E-03	0.1683E-04	0.3598	0.3397	-0.112E-01
0.500	1.4806	0.1666E-03	0.5333E-05	0.3615	0.3377	-0.390E-02
0.450	1.3422	0.1500E-03	-0.2733E-05	0.3632	0.3352	0.221E-02
0.400	1.2053	0.1333E-03	-0.7566E-05	0.3663	0.3318	0.689E-02
0.350	1.0692	0.1166E-03	-0.9400E-05	0.3688	0.3273	0.972E-02
0.300	0.9342	0.9999E-04	-0.8466E-05	0.3711	0.3211	0.100E-01
0.250	0.7998	0.8333E-04	-0.4999E-05	0.3724	0.3125	0.698E-02
0.200	0.6657	0.6666E-04	0.7666E-06	0.3705	0.3004	-0.128E-02
0.150	0.5299	0.4999E-04	0.8400E-05	0.3592	0.2830	-0.170E-01
0.100	0.3872	0.3333E-04	0.1720E-04	0.3480	0.2582	-0.463E-01

RE(DELTA) = 5450.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	2.1760	0.1284E-03	0.1023E-03	0.4201	0.3216	-0.107E 00
0.650	2.0541	0.1192E-03	0.6855E-04	0.3912	0.3164	-0.711E-01
0.600	1.9198	0.1100E-03	0.4365E-04	0.3623	0.3125	-0.448E-01
0.550	1.7779	0.1009E-03	0.2543E-04	0.3456	0.3093	-0.269E-01
0.500	1.6304	0.9174E-04	0.1144E-04	0.3351	0.3066	-0.128E-01
0.450	1.4795	0.8256E-04	0.1100E-05	0.3294	0.3041	-0.133E-02
0.400	1.3269	0.7339E-04	-0.6091E-05	0.3269	0.3014	0.817E-02
0.350	1.1736	0.6422E-04	-0.1047E-04	0.3264	0.2982	0.158E-01
0.300	1.0206	0.5504E-04	-0.1231E-04	0.3275	0.2939	0.215E-01
0.250	0.8683	0.4587E-04	-0.1177E-04	0.3292	0.2879	0.243E-01
0.200	0.7169	0.3669E-04	-0.9100E-05	0.3306	0.2789	0.228E-01
0.150	0.5659	0.2752E-04	-0.4440E-05	0.3285	0.2650	0.140E-01
0.100	0.4125	0.1834E-04	0.1798E-05	0.3096	0.2424	-0.735E-02
0.050	0.2420	0.9174E-05	0.8825E-05	0.2906	0.2066	-0.577E-01

RE(DELTA) = 7000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.9381	0.9999E-04	0.7887E-04	-6.7038	0.3611	0.190E 01
0.650	1.9448	0.9285E-04	0.7188E-04	-2.7431	0.3342	0.709E 00
0.600	1.9195	0.8571E-04	0.5032E-04	1.2174	0.3125	-0.229E 00
0.550	1.8105	0.7857E-04	0.3092E-04	0.4173	0.3037	-0.499E-01
0.500	1.6775	0.7142E-04	0.1612E-04	0.3575	0.2980	-0.240E-01
0.450	1.5301	0.6428E-04	0.5085E-05	0.3320	0.2940	-0.772E-02
0.400	1.3762	0.5714E-04	-0.2899E-05	0.3208	0.2906	0.473E-02
0.350	1.2184	0.4999E-04	-0.8114E-05	0.3153	0.2872	0.147E-01
0.300	1.0591	0.4285E-04	-0.1085E-04	0.3135	0.2832	0.225E-01
0.250	0.8995	0.3571E-04	-0.1135E-04	0.3138	0.2779	0.277E-01
0.200	0.7405	0.2857E-04	-0.9757E-05	0.3149	0.2700	0.290E-01
0.150	0.5820	0.2142E-04	-0.6257E-05	0.3143	0.2577	0.236E-01
0.100	0.422	0.1428E-04	-0.1100E-05	0.3014	0.2367	0.549E-02
0.050	0.2498	0.7142E-05	0.5014E-05	0.2885	0.2001	-0.405E-01

NA = 0.0750 XW/U = 9.0000 WT = 3.9270

PROFILE COEFFICIENTS -1.33680 9.12540 -21.28500 17.46700 13.19800 -39.23500 3C.23600 -8.15150

RE(DELTA) = 1000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.7430	0.6999E-03	0.3669E-04	0.4464	0.4016	-0.939E-02
0.650	1.6312	0.6500E-03	0.2379E-04	0.4472	0.3984	-0.652E-02
0.600	1.5194	0.5999E-03	0.1519E-04	0.4480	0.3948	-0.448E-02
0.550	1.4080	0.5499E-03	0.1059E-04	0.4494	0.3906	-0.338E-02
0.500	1.2969	0.5000E-03	0.1000E-04	0.4508	0.3855	-0.347E-02
0.450	1.1862	0.4499E-03	0.1299E-04	0.4520	0.3793	-0.495E-02
0.400	1.0757	0.4000E-03	0.1970E-04	0.4533	0.3718	-0.830E-02

RE(DELTA) = 1100.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.7682	0.6363E-03	0.2527E-04	0.4385	0.3558	-0.689E-02
0.650	1.6542	0.5909E-[illegible]	0.1209E-04	0.4387	0.3929	-0.352E-02
0.600	1.5403	[illegible]	0.2818E-05	0.4389	0.3895	-0.883E-03
0.550	1.4264	0.4999E-03	-0.2181E-05	0.4403	0.3855	0.740E-03
0.500	1.3132	0.4545E-03	-0.3454E-05	0.4420	0.3807	0.127E-02
0.450	1.2002	0.4090E-03	-0.1000E-05	0.4432	0.3749	0.406E-03
0.400	1.0876	0.3636E-03	0.4909E-05	0.4444	0.3677	-0.220E-02

RE(DELTA) = 1400.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.8329	0.4999E-03	0.9071E-05	0.4185	0.3819	-0.290E-02
0.650	1.7136	0.4642E-03	-0.5357E-05	0.4184	0.3793	0.183E-02
0.600	1.5939	0.4285E-03	-0.1578E-04	0.4182	0.3764	0.579E-02
0.550	1.4745	0.3928E-03	-0.2242E-04	0.4194	0.3730	0.893E-02
0.500	1.3555	0.3571E-03	-0.2535E-04	0.4208	0.3688	0.110E-01
0.450	1.2369	0.3214E-03	-0.2471E-04	0.4224	0.3638	0.118E-01
0.400	1.1188	0.2857E-03	-0.2071E-04	0.4240	0.3575	0.109E-01
0.350	1.0011	0.2499E-03	-0.1350E-04	0.4248	0.3496	0.802E-02
0.300	0.8834	0.2142E-03	-0.3357E-05	0.4240	0.3395	0.225E-02
0.250	0.7653	0.1785E-03	0.9500E-05	0.4201	0.3266	-0.730E-02
0.200	0.6454	0.1428E-03	0.2478E-04	0.4088	0.3098	-0.219E-01
0.150	0.5206	0.1071E-03	0.4207E-04	0.3974	0.2881	-0.449E-01

RE(DELTA) = 1700.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.8847	0.4117E-03	0.5294E-05	0.4066	0.3714	-0.194E-02
0.650	1.7618	0.3823E-03	-0.9882E-05	0.4053	0.3689	0.386E-02
0.600	1.6380	0.3529E-03	-0.2135E-04	0.4040	0.3663	0.895E-02
0.550	1.5143	0.3235E-03	-0.2917E-04	0.4043	0.3632	0.132E-01
0.500	1.3907	0.2941E-03	-0.3347E-04	0.4053	0.3595	0.165E-01
0.450	1.2676	0.2647E-03	-0.3429E-04	0.4066	0.3550	0.187E-01
0.400	1.1448	0.2352E-03	-0.3188E-04	0.4081	0.3494	0.193E-01
0.350	1.0226	0.2058E-03	-0.2635E-04	0.4095	0.3422	0.179E-01
0.300	0.9006	0.1764E-03	-0.1788E-04	0.4100	0.3331	0.138E-01
0.250	0.7787	0.1470E-03	-0.6764E-05	0.4081	0.3210	0.602E-02
0.200	0.6556	0.1176E-03	0.6764E-05	0.4004	0.3050	-0.702E-02
0.150	0.5289	0.8823E-04	0.2223E-04	0.3926	0.2836	-0.280E-01

RE(DELTA) = 2500.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.8520	0.2600E-03	-0.4359E-05	0.3922	0.3509	0.230E-02
0.600	1.7242	0.2399E-03	-0.1752E-04	0.3873	0.3479	0.983E-02
0.550	1.5938	0.2199E-03	-0.2744E-04	0.3824	0.3450	0.164E-01
0.500	1.4627	0.2000E-03	-0.3412E-04	0.3805	0.3418	0.221E-01
0.450	1.3310	0.1800E-03	-0.3764E-04	0.3796	0.3380	0.268E-01
0.400	1.1993	0.1599E-03	-0.3819E-04	0.3800	0.3335	0.302E-01
0.350	1.0679	0.1399E-03	-0.3583E-04	0.3810	0.3277	0.319E-01
0.300	0.9369	0.1199E-03	-0.3075E-04	0.3822	0.3202	0.313E-01
0.250	0.8063	0.1000E-03	-0.2304E-04	0.3827	0.3100	0.273E-01
0.200	0.6756	0.7999E-04	-0.1291E-04	0.3800	0.2960	0.181E-01
0.150	0.5432	0.5999E-04	-0.7599E-06	0.3774	0.2761	0.132E-02

RE(DELTA) = 3500.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.9105	0.1857E-03	0.6428E-05	0.4094	0.3402	-0.482E-02
0.600	1.7869	0.1714E-03	-0.7085E-05	0.3942	0.3357	0.547E-02
0.550	1.6567	0.1571E-03	-0.1788E-04	0.3791	0.3319	0.143E-01
0.500	1.5231	0.1428E-03	-0.2597E-04	0.3704	0.3282	0.221E-01
0.450	1.3867	0.1285E-03	-0.3134E-04	0.3645	0.3245	0.288E-01

NA = 0.C'50   XW/U = 9.0000   WT = 3.9270

RE(DELTA) = 3500.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.400	1.2488	0.1142E-03	-0.3399E-04	0.3615	0.3203	0.344E-01
0.350	1.1101	0.9999E-04	-0.3405E-04	0.3603	0.3152	0.386E-01
0.300	0.9713	0.8571E-04	-0.3154E-04	0.3603	0.3088	0.409E-01
0.250	0.8326	0.7142E-04	-0.2657E-04	0.3608	0.3002	0.403E-C1
0.200	0.6942	0.5714E-04	-0.1925E-04	0.3603	0.2881	0.349E-01
0.150	0.5551	0.4285E-04	-0.9857E-05	0.3598	0.2702	0.223E-01

RE(DELTA) = 5450.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.9288	0.1192E-03	0.1304E-04	0.4895	0.3369	-0.180E-01
0.600	1.8237	0.1100E-03	0.3871E-05	0.4522	0.3290	-0.523E-02
0.550	1.7071	0.1009E-03	-0.5027E-05	0.4150	0.3221	0.666E-02
0.500	1.5825	0.9174E-04	-0.1282E-04	0.3884	0.3159	0.171E-01
0.450	1.4494	0.8256E-04	-0.1906E-04	0.3671	0.3104	0.263E-01
0.400	1.3100	0.7339E-04	-0.2339E-04	0.3528	0.3053	0.343E-01
0.350	1.1659	0.6422E-04	-0.2566E-04	0.3436	0.3001	0.412E-01
0.300	1.0190	0.5504E-04	-0.2581E-04	0.3386	0.2944	0.467E-01
0.250	0.3706	0.4587E-04	-0.2379E-04	0.3361	0.2871	0.500E-01
0.200	0.7215	0.3669E-04	-0.1966E-04	0.3348	0.2772	0.497E-01
0.150	0.5720	0.2752E-04	-0.1350E-04	0.3322	0.2622	0.427E-01
0.100	0.4205	0.1834E-04	-0.5504E-05	0.3295	0.2378	0.235E-01

RE(DELTA) = 7000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.9248	0.9285E-04	0.1100E-04	0.5020	0.3376	-0.200E-01
0.600	1.8224	0.8571E-04	0.4885E-05	0.4730	0.3292	-0.887E-02
0.550	1.7132	0.7857E-04	-0.1500E-05	0.4440	0.3210	0.272E-02
0.500	1.5970	0.7142E-04	-0.7499E-05	0.4145	0.3130	0.136E-01
0.450	1.4716	0.6428E-04	-0.1294E-04	0.3849	0.3057	0.237E-01
0.400	1.336[illegible]	0.5714E-04	-0.1730E-04	0.3606	0.2991	0.326E-01
0.350	1.1941	0.4999E-04	-0.2018E-04	0.3433	0.2931	0.406E-01
0.300	1.045[illegible]	0.4285E-04	-0.2132E-04	0.3322	0.2869	0.474E-01
0.250	0.893[illegible]	0.3571E-04	-0.2058E-04	0.3258	0.2799	0.525E-01
0.200	0.7386	0.2857E-04	-0.1791E-04	0.3224	0.2707	0.547E-01
0.150	0.5830	0.2142E-04	-0.1331E-04	0.3191	0.2572	0.510E-01

NA = 0.0750   XW/U = 9.0000   WT = 4.7124

PROFILE COEFFICIENTS -0.71103 0.05213 29.77300-130.77001 257.52002-270.41003 147.32000 -32.76200

RE(DELTA) = 850.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.750	1.7632	0.8823E-03	0.8000E-05	0.4819	0.4253	-0.185E-02
0.700	1.6596	0.8235E-03	-0.9411E-06	0.4812	0.4217	0.231E-03
0.650	1.5554	0.7647E-03	-0.6588E-05	0.4805	0.4178	0.173E-02
0.600	1.4515	0.7058E-03	-0.8588E-05	0.4814	0.4133	0.242E-02
0.550	1.3477	0.6470E-03	-0.7058E-05	0.4819	0.4081	0.214E-02
0.500	1.2440	0.5882E-03	-0.1882E-05	0.4821	0.4019	0.620E-03
0.450	1.1403	0.5294E-03	0.6470E-05	0.4821	0.3946	-0.232E-02
0.400	1.0366	0.4705E-03	0.1799E-04	0.4821	0.3858	-0.711E-02

RE(DELTA) = 1200.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.800	1.9463	0.6666E-03	-0.6749E-05	0.4574	0.4110	0.190E-02
0.700	1.7277	0.5833E-03	-0.3258E-04	0.4561	0.4051	0.103E-01
0.600	1.5078	0.4999E-03	-0.4466E-04	0.4547	0.3979	0.161E-01
0.500	1.2879	0.4166E-03	-0.4366E-04	0.4550	0.3882	0.185E-01
0.400	1.0683	0.3333E-03	-0.3033E-04	0.4549	0.3744	0.155E-01
0.300	0.8483	0.2499E-03	-0.5666E-05	0.4492	0.3536	0.360E-02
0.200	0.6231	0.1666E-03	0.2849E-04	0.4211	0.3209	-0.231E-01
0.100	0.3720	0.8333E-04	0.7191E-04	0.3929	0.2688	-0.911E-01

RE(DELTA) = 2000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.800	2.0438	0.4000E-03	-0.5500E-06	0.4553	0.3914	0.245E-03
0.700	1.8220	0.3499E-03	-0.2870E-04	0.4422	0.3841	0.139E-01
0.600	1.5914	0.2999E-03	-0.4629E-04	0.4291	0.3770	0.249E-01
0.500	1.3559	0.2500E-03	-0.5305E-04	0.4229	0.3687	0.330E-01
0.400	1.1185	0.2000E-03	-0.4915E-04	0.4205	0.3576	0.369E-01
0.300	0.8803	0.1499E-03	-0.3509E-04	0.4183	0.3407	0.333E-01
0.200	0.6404	0.1000E-03	-0.1169E-04	0.4037	0.3123	0.147E-01
0.100	0.3844	0.5000E-04	0.1880E-04	0.3891	0.2601	-0.380E-01

RE(DELTA) = 3000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.750	1.9775	0.2500E-03	-0.2100E-05	0.4827	0.3792	0.153E-02
0.700	1.8723	0.2333E-03	-0.1323E-04	0.4636	0.3738	0.983E-02
0.650	1.7617	0.2166E-03	-0.2310E-04	0.4445	0.3689	0.174E-01
0.600	1.6473	0.1999E-03	-0.3126E-04	0.4303	0.3642	0.245E-01
0.550	1.5293	0.1833E-03	-0.3753E-04	0.4188	0.3596	0.308E-01
0.500	1.4085	0.1666E-03	-0.4173E-04	0.4102	0.3549	0.364E-01
0.450	1.2855	0.1500E-03	-0.4379E-04	0.4040	0.3500	0.413E-01
0.400	1.1610	0.1333E-03	-0.4363E-04	0.3998	0.3445	0.450E-01
0.350	1.0354	0.1166E-03	-0.4126E-04	0.3968	0.3380	0.474E-01
0.300	0.9090	0.9999E-04	-0.3666E-04	0.3949	0.3300	0.477E-01
0.250	0.7822	0.8333E-04	-0.2990E-04	0.3932	0.3196	0.450E-01
0.200	0.6547	0.6666E-04	-0.2103E-04	0.3894	0.3054	0.375E-01
0.150	0.5254	0.4999E-04	-0.1030E-04	0.3789	0.2854	0.222E-01
0.100	0.3907	0.3333E-04	0.1866E-05	0.3684	0.2559	-0.528E-02

RE(DELTA) = 5450.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.750	1.9844	0.1376E-03	0.1761E-05	0.5181	0.3779	-0.250E-02
0.700	1.8866	0.1284E-03	-0.3339E-05	0.5033	0.3710	0.485E-02
0.650	1.7857	0.1192E-03	-0.8366E-05	0.4886	0.3640	0.124E-01
0.600	1.6819	0.1100E-03	-0.1310E-04	0.4723	0.3567	0.200E-01
0.550	1.5739	0.1009E-03	-0.1755E-04	0.4525	0.3494	0.275E-01
0.500	1.4608	0.9174E-04	-0.2152E-04	0.4314	0.3422	0.346E-01
0.450	1.3420	0.8256E-04	-0.2473E-04	0.4114	0.3353	0.413E-01
0.400	1.2176	0.7339E-04	-0.2686E-04	0.3943	0.3285	0.474E-01
0.350	1.0883	0.6422E-04	-0.2765E-04	0.3811	0.3216	0.527E-01
0.300	0.9552	0.5504E-04	-0.2682E-04	0.3713	0.3140	0.568E-01
0.250	0.8190	0.4587E-04	-0.2438E-04	0.3644	0.3052	0.591E-01
0.200	0.6808	0.3669F-04	-0.2012E-04	0.3592	0.2937	0.578E-01
0.150	0.5406	0.2752E-04	-0.1411E-04	0.3525	0.2774	0.501E-01
0.100	0.3971	0.1834E-04	-0.6458E-05	0.3339	0.2518	0.296E-01
0.050	0.2406	0.9174E-05	0.2275E-05	0.3153	0.2078	-0.162E-01

RE(DELTA) = 7000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.750	1.9889	0.1071E-03	0.8000E-06	0.5065	0.3770	-0.142E-02
0.700	1.8893	0.9999E-04	-0.2985E-05	0.4968	0.3705	0.549E-02
0.650	1.7876	0.9285E-04	-0.6585E-05	0.4871	0.3636	0.125E-01
0.600	1.6840	0.8571E-04	-0.9900E-05	0.4769	0.3562	0.196E-01
0.550	1.5779	0.7857E-04	-0.1298E-04	0.4637	0.3485	0.267E-01
0.500	1.4683	0.7142E-04	-0.1585E-04	0.4464	0.3405	0.337E-01
0.450	1.3538	0.6428E-04	-0.1841E-04	0.4258	0.3323	0.405E-01
0.400	1.2333	0.5714E-04	-0.2045E-04	0.4043	0.3243	0.469E-01
0.350	1.1063	0.4999E-04	-0.2168E-04	0.3849	0.3163	0.528E-01
0.300	0.9734	0.4285E-04	-0.2179E-04	0.3692	0.3081	0.578E-01
0.250	0.8354	0.3571E-04	-0.2052E-04	0.3573	0.2992	0.614E-01
0.200	0.6935	0.2857E-04	-0.1771E-04	0.3488	0.2883	0.623E-01
0.150	0.5487	0.2142E-04	-0.1325E-04	0.3414	0.2733	0.577E-01
0.100	0.4006	0.1428E-04	-0.7185E-05	0.3261	0.2496	0.409E-01
0.050	0.2417	0.7142E-05	0.8571E-07	0.3108	0.2068	-0.771E-03

NA = 0.0750 XW/U = 9.0000 WT = 5.4978

PROFILE COEFFICIENTS 0.34090 -9.04540 63.93200-199.52001 335.41003-318.65002 161.57000 -34.02700

RE(DELTA) = 800.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.750	1.6214	0.9375E-03	0.1349E-04	0.5347	0.4625	-0.356E-02
0.700	1.5279	0.8750E-03	0.8125E-05	0.5330	0.4581	-0.226E-02
0.650	1.4338	0.8125E-03	0.5750E-05	0.5313	0.4533	-0.170E-02
0.600	1.3397	0.7499E-03	0.6124E-05	0.5305	0.4478	0.194E-02
0.550	1.2453	0.6874E-03	0.9499E-05	0.5291	0.4416	-0.322E-02
0.500	1.1507	0.6250E-03	0.1562E-04	0.5274	0.4345	-0.572E-02
0.450	1.0557	0.5625E-03	0.2437E-04	0.5249	0.4262	-0.969E-02
0.400	0.9602	0.5000E-03	0.3562E-04	0.5211	0.4165	-0.154E-01
0.350	0.8638	0.4375E-03	0.4912E-04	0.5172	0.4051	-0.235E-01

RE(DELTA) = 860.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.750	1.6329	0.8720E-03	0.4069E-05	0.5360	0.4593	-0.114E-02
0.700	1.5384	0.8139E-03	-0.1627E-05	0.5310	0.4550	0.483E-03
0.650	1.4446	0.7558E-03	-0.6162E-05	0.5261	0.4499	0.193E-02
0.600	1.3483	0.6976E-03	-0.4534E-05	0.5227	0.4450	0.151E-02
0.550	1.2533	0.6395E-03	-0.1976E-05	0.5235	0.4388	0.710E-03
0.500	1.1573	0.5813E-03	0.3953E-05	0.5243	0.4320	-0.154E-02

RE(DELTA) = 1200.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.800	1.7824	0.6666E-03	-0.6666E-05	0.5149	0.4488	0.231E-02
0.700	1.5874	0.5833E-03	-0.2466E-04	0.5093	0.4409	0.949E-02
0.600	1.3897	0.4999E-03	-0.3208E-04	0.5036	0.4317	0.139E-01
0.500	1.1903	0.4166E-03	-0.2941E-04	0.4996	0.4200	0.148E-01
0.400	0.9894	0.3333E-03	-0.1691E-04	0.4947	0.4042	0.101E-01
0.300	0.7860	0.2499E-03	0.4416E-05	0.4830	0.3816	-0.325E-02
0.200	0.5752	0.1666E-03	0.3275E-04	0.4713	0.3477	-0.322E-01

RE(DELTA) = 2000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.800	1.8473	0.4000E-03	0.9999E-07	0.5243	0.4330	-0.567E-04
0.700	1.6538	0.3499E-03	-0.1984E-04	0.5049	0.423[illegible]	0.121E-01
0.600	1.4510	0.2999E-03	-0.3250E-04	0.4855	0.41[illegible]	0.217E-01
0.500	1.2418	0.2500E-03	-0.3709E-04	0.4730	0.4026	0.282E-01
0.400	1.0282	0.2000E-03	-0.3334E-04	0.4643	0.3890	0.301E-01
0.300	0.8111	0.1499E-03	-0.2159E-04	0.4557	0.3698	0.242E-01
0.200	0.5893	0.1000E-03	-0.2549E-05	0.4322	0.3393	0.374E-02
0.100	0.3475	0.5000E-04	0.2094E-04	0.4086	0.2877	-0.492E-01

RE(DELTA) = 3000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.800	1.8627	0.2666E-03	0.7433E-05	0.5753	0.4294	-0.688E-02
0.700	1.6831	0.2333E-03	-0.7766E-05	0.5363	0.4158	0.742E-02
0.600	1.4893	0.1999E-03	-0.2036E-04	0.4974	0.4028	0.204E-01
0.500	1.2805	0.1666E-03	-0.2803E-04	0.4676	0.3904	0.307E-01
0.400	1.0614	0.1[illegible]33E-03	-0.2949E-04	0.4483	0.3768	0.373E-01
0.300	0.8343	0.9999E-04	-0.2400E-04	0.4349	0.3595	0.375E-01
0.200	0.6015	0.6666E-04	-0.1156E-04	0.4172	0.3325	0.240E-01
0.100	0.3546	0.3333E-04	0.6099E-05	0.3996	0.2820	-0.206E-01

RE(DELTA) = 5450.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.750	1.7711	0.1376E-03	0.1009E-05	0.5769	0.4234	-0.179E-02
0.700	1.6834	0.1284E-03	-0.1871E-05	0.5669	0.4158	0.343E-02
0.650	1.5947	0.1192E-03	-0.4770E-05	0.5568	0.4076	0.907E-02
0.60[illegible]	1.5038	0.1100E-03	-0.7486E-05	0.5426	0.3989	0.147E-01
0.5[illegible]	1.4104	0.1009E-03	-0.1022E-04	0.5246	0.3899	0.207E-01
0.500	1.3131	0.9174E-04	-0.1284E-04	0.5010	0.3807	0.267E-01
0.450	1.2107	0.8256E-04	-0.1517E-04	0.4758	0.3716	0.325E-01
0.400	1.1028	0.7339E-04	-0.1688E-04	0.4521	0.3627	0.377E-01
0.350	0.9894	0.6422E-04	-0.1766E-04	0.4319	0.3537	0.420E-01
0.300	0.8712	0.5504E-04	-0.1728E-04	0.4160	0.3443	0.449E-01
0.250	0.7490	0.4587E-04	-0.1555E-04	0.4036	0.3337	0.456E-01
0.200	0.6234	0.3669E-04	-0.1238E-04	0.3929	0.3208	0.425E-01
0.150	0.4945	0.2752E-04	-0.7798E-05	0.3807	0.3033	0.327E-01
0.100	0.3607	0.1834E-04	-0.2036E-05	0.3542	0.2772	0.109E-01
0.050	0.2114	0.9174E-05	0.4036E-05	0.3277	0.2365	-0.341E-01

RE(DELTA) = 7000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5945	0.9285E-04	-0.3828E-05	0.5547	0.4076	0.932E-02
0.600	1.5022	0.8571E-04	-0.5714E-05	0.5437	0.3994	0.144E-01
0.550	1.4106	0.7857E-04	-0.7457E-05	0.5328	0.3899	0.197E-01
0.500	1.3144	0.7142E-04	-0.9085E-05	0.5144	0.3804	0.248E-01
0.450	1.2162	0.6428E-04	-0.1075E-04	0.4958	0.3700	0.307E-01
0.400	1.1126	0.5714E-04	-0.1224E-04	0.4685	0.3595	0.360E-01
0.350	1.0026	0.4999E-04	-0.1330E-04	0.4413	0.3490	0.409E-01
0.300	0.8858	0.4285E-04	-0.1362E-04	0.4174	0.3386	0.449E-01
0.250	0.7629	0.3571E-04	-0.1290E-04	0.3985	0.3276	0.471E-01
0.200	0.6348	0.2857E-04	-0.1094E-04	0.3838	0.3150	0.463E-01
0.150	0.5023	0.2142E-04	-0.7628E-05	0.3702	0.2986	0.393E-01
0.100	0.3646	0.1428E-04	-0.3099E-05	0.3471	0.2742	0.206E-01
0.050	0.2136	0.7142E-05	0.2000E-05	0.3240	0.2340	-0.212E-01

NA = 0.1500 XW/U = 0.4000 WT = 0.0000

PROFILE COEFFICIENTS 0.26425 -1.07910 3.76720 -1.35350 -16.81900 32.97800 -24.06300 6.32240

RE(DELTA) = 1200.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.4393	0.5416E-03	0.6558E-04	0.5197	0.4516	-0.284E-01
0.600	1.3429	0.4999E-03	0.5624E-04	0.5165	0.4457	-0.259E-01
0.550	1.2457	0.4583E-03	0.4975E-04	0.5133	0.4415	-0.246E-01
0.500	1.1481	0.4166E-03	0.4608E-04	0.5109	0.4355	-0.246E-01
0.450	1.0500	0.3750E-03	0.4500E-04	0.5078	0.4285	-0.261E-01
0.400	0.9512	0.3333E-03	0.4633E-04	0.5040	0.4205	-0.294E-01
0.350	0.8516	0.2916E-03	0.4983E-04	0.4985	0.4109	-0.350E-01
0.300	0.7506	0.2499E-03	0.5508E-04	0.4897	0.3996	-0.431E-01
0.250	0.6474	0.2083E-03	0.6174E-04	0.4756	0.3861	-0.544E-01
0.200	0.5403	0.1666E-03	0.6925E-04	0.4615	0.3701	-0.709E-01

RE(DELTA) = 1835.

BETAR*DELTA/U	ALFAR*DFLTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.4168	0.3269E-03	0.3618E-04	0.4870	0.4234	-0.228E-01
0.550	1.3139	0.2997E-03	0.2702E-04	0.4817	0.4186	-0.181E-01
0.500	1.2092	0.2724E-03	0.2059E-04	0.4764	0.4134	-0.148E-01
0.450	1.1040	0.2452E-03	0.1689E-04	0.4734	0.4076	-0.132E-01
0.400	0.9980	0.2179E-03	0.1564E-04	0.4703	0.4008	-0.135E-01
0.350	0.8914	0.1907E-03	0.1662E-04	0.4668	0.3926	-0.159E-01
0.300	0.7838	0.1634E-03	0.1972E-04	0.4619	0.3827	-0.213E-01
0.250	0.6749	0.1362E-03	0.2446E-04	0.4535	0.3704	-0.301E-01
0.200	0.5633	0.1089E-03	0.3046E-04	0.4452	0.3550	-0.441E-01

RE(DELTA) = 3010.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.5063	0.1993E-03	0.3744E-04	0.4749	0.3983	-0.355E-01
0.550	1.3999	0.1827E-03	0.2471E-04	0.4618	0.3928	-0.245E-01
0.500	1.2897	0.1661E-03	0.1518E-04	0.4486	0.3876	-0.158E-01
0.450	1.1770	0.1495E-03	0.8471E-05	0.4399	0.3823	-0.953E-02
0.400	1.0624	0.1328E-03	0.4352E-05	0.4338	0.3765	-0.534E-02
0.350	0.9465	0.1162E-03	0.2558E-05	0.4295	0.3697	-0.349E-02
0.300	0.8296	0.9966E-04	0.2923E-05	0.4257	0.3616	-0.451E-02
0.250	0.7116	0.8305E-04	0.5149E-05	0.4218	0.3513	-0.918E-02

NA = 0.1500 XW/U = 0.4000 WT = 1.5708

PRO. .LE COEFFICIENTS 0.14699 -0.00747 3.51130 -11.18200 9.77550 1.05790 -5.03190 1.74680

RE(DELTA) = 1200.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.4689	0.5416E-03	0.4449E-04	0.5135	0.4425	-0.186E-01
0.600	1.3714	0.4999E-03	0.3875E-04	0.5107	0.4375	-0.173E-01
0.550	1.2731	0.4583E-03	0.3566E-04	0.5078	0.4320	-0.170E-01
0.500	1.1745	0.4166E-03	0.3499E-04	0.5058	0.4257	-0.180E-01
0.450	1.0754	0.3750E-03	0.3674E-04	0.5030	0.4184	-0.206E-01
0.400	0.9757	0.3333E-03	0.4058E-04	0.4990	0.4099	-0.249E-01
0.350	0.8750	0.2916E-03	0.4633E-04	0.4928	0.3999	-0.313E-01
0.300	0.7728	0.2499E-03	0.5374E-04	0.4833	0.3881	-0.403E-01
0.250	0.6681	0.2083E-03	0.6241E-04	0.4677	0.3741	-0.524E-01
0.200	0.5589	0.1666E-03	0.7191E-04	0.4520	0.3578	-0.697E-01

RE(DELTA) = 1835.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5480	0.3542E-03	0.2474E-04	0.4871	0.4198	-0.142E-01
0.600	1.4445	0.3269E-03	0.1645E-04	0.4807	0.4153	-0.100E-01
0.550	1.3400	0.2997E-03	0.1040E-04	0.4744	0.4104	-0.676E-02
0.500	1.2337	0.2724E-03	0.7138E-05	0.4705	0.4052	-0.499E-02
0.450	1.1275	0.2452E-03	0.5994E-05	0.4638	0.3991	-0.457E-02
0.400	1.0204	0.2179E-03	0.7193E-05	0.4662	0.3920	-0.603E-02
0.350	0.9130	0.1907E-03	0.1029E-04	0.4631	0.3833	-0.958E-02
0.300	0.8045	0.1634E-0	0.1536E-04	0.4576	0.3729	-0.160E-01
0.250	0.6945	0.1362E-0	0.2179E-04	0.4483	0.3599	-0.258E-01
0.200	0.5814	0.1089E-03	0.2942E-04	0.4311	0.3439	-0.400E-01
0.150	0.4624	0.8174E-04	0.3743E-04	0.3989	0.3243	-0.592E-01
0.100	0.3300	0.5449E-04	0.4544E-04	0.3410	0.3030	-0.861E-01
0.050	0.1658	0.2724E-04	0.5149E-04	0.2832	0.3015	-0.161E 00

RE(DELTA) = 2000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.4597	0.2999E-03	0.1479E-04	0.4722	0.4110	-0.957E-02
0.500	1.2466	0.2500E-03	0.4600E-05	0.4658	0.4010	-0.343E-02
0.400	1.0304	0.2000E-03	0.3549E-05	0.4595	0.3881	-0.316E-02
0.300	0.8114	0.1499E-03	0.1059E-04	0.4498	0.3697	-0.117E-01
0.200	0.5857	0.1000E-03	0.2384E-04	0.4401	0.3414	-0.358E-01

RE(DELTA) = 3010.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.6401	0.2159E-03	0.2767E-04	0.4766	0.3963	-0.242E-01
0.600	1.5344	0.1993E-03	0.1654E-04	0.4627	0.3910	-0.150E-01
0.550	1.4239	0.1827E-03	0.7441E-05	0.4488	0.3862	-0.706E-02
0.500	1.3116	0.1661E-03	0.1162E-05	0.4409	0.3812	-0.117E-02
0.450	1.1971	0.1495E-03	-0.2923E-05	0.4347	0.3759	0.319E-02
0.400	1.0816	0.1328E-03	-0.4684E-05	0.4306	0.3698	0.561E-02
0.350	0.9649	0.1162E-03	-0.4551E-05	0.4268	0.3627	0.605E-02
0.300	0.8473	0.9966E-04	-0.2458E-05	0.4231	0.3540	0.369E-02
0.250	0.7286	0.8305E-04	0.1295E-05	0.4182	0.3431	-0.223E-02
0.200	0.6082	0.6644E-04	0.6511E-05	0.4133	0.3288	-0.133E-01

RE(DELTA) = 5000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.5935	0.1199E-03	0.2731E-04	0.5040	0.3765	-0.432E-01
0.500	1.3905	0.1000E-03	0.7419E-05	0.4559	0.3595	-0.121E-01
0.400	1.1520	0.7999E-04	-0.3499E-05	0.4078	0.3472	0.619E-02
0.300	0.8997	0.5999E-04	-0.6320E-05	0.3897	0.3334	0.136E-01
0.200	0.6387	0.3999E-04	-0.2320E-05	0.3716	0.3131	0.675E-02

RE(DELTA) = 10000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.400	1.2293	0.3999E-04	0.4780E-05	0.4110	0.3253	-0.159E-01
0.300	0.9806	0.2999E-04	-0.2910E-05	0.3756	0.3059	0.111E-01
0.200	0.6943	0.1999E-04	-0.4099E-05	0.3403	0.2880	0.200E-01
0.100	0.3925	0.9999E-05	0.1800E-06	0.3049	0.2547	-0.139E-02

NA = 0.1500 XW/U = 0.4000 WT = 3.1416

PROFILE COEFFICIENTS -0.28435 1.08200 0.73636 -0.84368 -12.06800 25.02800 -18.43500 4.80220

RE(DELTA) = 1200.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.3930	0.4999E-03	0.9833E-05	0.5027	0.4307	-0.425E-02
0.550	1.2932	0.4583E-03	0.4166E-05	0.4982	0.4253	-0.192E-02
0.500	1.1923	0.4166E-03	0.1666E-05	0.4938	0.4193	-0.828E-03
0.450	1.0907	0.3750E-03	0.2750E-05	0.4911	0.4125	-0.148E-02
0.400	0.9887	0.3333E-03	0.5416E-05	0.4884	0.4045	-0.321E-02

RE(DELTA) = 1400.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.4176	0.4285E-03	0.5142E-05	0.4976	0.4232	-0.252E-02
0.550	1.3157	0.3928E-03	-0.1785E-05	0.4904	0.4180	0.931E-03
0.500	1.2137	0.3571E-03	-0.5785E-05	0.4831	0.4119	0.322E-02
0.450	1.1087	0.321[illegible]E-03	-0.6357E-05	0.4789	0.4058	0.3[illegible]E-02
0.400	1.0049	0.2857E-03	-0.4357E-05	0.4775	0.3980	0.289E-02
0.350	0.8993	0.2499E-03	0.5714E-06	0.4752	0.3891	-0.422E-03
0.300	0.7945	0.2142E-03	0.7642E-05	0.4729	0.3775	-0.637E-02

RE(DELTA) = 1835.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.4609	0.3269E-03	0.4632E-05	0.4787	0.4107	-0.278E-02
0.550	1.3551	0.2997E-03	-0.4523E-05	0.4730	0.4058	0.289E-02
0.500	1.2495	0.2724E-03	-0.1024E-04	0.4673	0.4001	0.703E-02
0.450	1.1411	0.2452E-03	-0.1346E-04	0.4625	0.3943	0.100E-01
0.400	1.0333	0.2179E-03	-0.1346E-04	0.4610	0.3871	0.110E-01
0.350	0.9242	0.1907E-03	-0.1100E-04	0.4553	0.3787	0.995E-02
0.300	0.8137	0.1634E-03	-0.5994E-05	0.4496	0.3686	0.607E-02
0.250	0.7018	0.1362E-03	0.1198E-05	0.4439	0.3562	-0.139E-02

RE(DELTA) = 3010.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.450	1.2066	0.1495E-03	-0.1043E-04	0.4374	0.3729	0.113E-01
0.400	1.0917	0.1328E-03	-0.1408E-04	0.4303	0.3664	0.167E-01
0.350	0.9742	0.1162E-03	-0.1524E-04	0.4232	0.3592	0.199E-01
0.300	0.8554	0.9966E-04	-0.1401E-04	0.4175	0.3507	0.205E-01
0.250	0.7347	0.8305E-04	-0.1056E-04	0.4130	0.3402	0.178E-01
0.200	0.6133	0.6644E-04	-0.5016E-05	0.4056	0.3261	0.998E-02
0.150	0.4881	0.4983E-04	0.2392E-05	0.3981	0.3073	-0.587E-02

RE(DELTA) = 5000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.500	1.3619	0.1000E-03	0.7439E-05	0.5173	0.3671	-0.141E-01
0.450	1.2619	0.9000E-04	-0.9999E-07	0.4746	0.3566	0.188E-03
0.400	1.1506	0.7999E-04	-0.5840E-05	0.4319	0.3476	0.109E-01
0.350	1.0300	0.6999E-04	-0.9859E-05	0.4063	0.3398	0.194E-01
0.300	0.9044	0.5999E-04	-0.1150E-04	0.3925	0.3317	0.249E-01
0.250	0.7752	0.5000E-04	-0.1119E-04	0.3837	0.3224	0.277E-01
0.200	0.6438	0.3999E-04	-0.8620E-05	0.3768	0.3106	0.252E-01
0.150	0.5098	0.2999E-04	-0.4479E-05	0.3674	0.2942	0.161E-01
0.100	0.3716	0.1999E-04	0.1399E-05	0.3581	0.2691	-0.674E-02

RE(DELTA) = 10000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.400	1.1697	0.3999E-04	0.2740E-05	0.5085	0.3419	-0.119E-01
0.300	0.9657	0.2999E-04	-0.3690E-05	0.4294	0.3106	0.164E-01
0.200	0.6945	0.1999E-04	-0.6359E-05	0.3503	0.2879	0.320E-01
0.100	0.3933	0.9999E-05	-0.2400E-05	0.2712	0.2542	0.165E-01

NA = 0.1500   XW/U = 0.4000   WT = 3.9270

PROFILE COEFFICIENTS -0.38595 0.82582 2.53630 -7.81600 6.82860 -1.97160 0.00000 0.00000

RE(DELTA) = 1200.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.2862	0.4583E-03	0.6916E-05	0.5014	0.4276	-0.323E-02
0.500	1.1853	0.4166E-03	0.9999E-06	0.4933	0.4218	-0.499E-03
0.450	1.0835	0.3750E-03	-0.1249E-05	0.4852	0.4153	0.671E-03
0.400	0.9792	0.3333E-03	0.4999E-06	0.4862	0.4084	-0.297E-03
0.350	0.8778	0.2916E-03	0.4333E-05	0.4872	0.3987	-0.288E-02

RE(DELTA) = 1835.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.3499	0.2997E-03	0.3705E-05	0.4757	0.4074	-0.239E-02
0.500	1.2441	0.2724E-03	-0.5504E-05	0.4686	0.4018	0.380E-02
0.450	1.1365	0.2452E-03	-0.1128E-04	0.4614	0.3959	0.840E-02
0.400	1.0274	0.2179E-03	-0.1378E-04	0.4533	0.3893	0.111E-01
0.350	0.9159	0.1907E-03	-0.1329E-04	0.4514	0.3821	0.120E-01
0.300	0.8059	0.1634E-03	-0.9754E-05	0.4498	0.3722	0.999E-02
0.250	0.6936	0.1362E-03	-0.3487E-05	0.4415	0.3604	0.407E-02
0.200	0.5794	0.1089E-03	0.5286E-05	0.4331	0.3451	-0.725E-02

RE(DELTA) = 3010.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.500	1.3088	0.1661E-03	0.3554E-05	0.4648	0.3820	-0.380E-02
0.450	1.2000	0.1495E-03	-0.5481E-05	0.4492	0.3750	0.617E-02
0.400	1.0861	0.1328E-03	-0.1126E-04	0.4337	0.3682	0.135E-01
0.350	0.9694	0.1162E-03	-0.1425E-04	0.4230	0.3610	0.187E-01
0.300	0.8497	0.9966E-04	-0.1455E-04	0.4152	0.3530	0.214E-01
0.250	0.7286	0.8305E-04	-0.1222E-04	0.4111	0.3431	0.207E-01
0.200	0.6065	0.6644E-04	-0.7375E-05	0.4030	0.3297	0.147E-01
0.150	0.4804	0.4983E-04	-0.3654E-06	0.3948	0.3122	0.904E-03

RE(DELTA) = 5000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.450	1.2424	0.9000E-04	0.5679E-05	0.4964	0.3622	-0.113E-01
0.400	1.1390	0.7999E-04	-0.1760E-05	0.4572	0.3511	0.353E-02
0.350	1.0230	0.6999E-04	-0.7200E-05	0.4181	0.3421	0.147E-01
0.300	0.8996	0.5999E-04	-0.1028E-04	0.3959	0.3334	0.226E-01
0.250	0.7703	0.5000E-04	-0.1106E-04	0.3827	0.3245	0.274E-01
0.200	0.6383	0.3999E-04	-0.9419E-05	0.3741	0.3133	0.276E-01
0.150	0.5030	0.2999E-04	-0.5740E-05	0.3654	0.2982	0.208E-01
0.100	0.3646	0.1999E-04	-0.1599E-06	0.3566	0.2742	0.782E-03

RE(DELTA) = 10000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.400	1.1360	0.3999E-04	0.3950E-05	0.5644	0.3521	-0.196E-01
0.300	0.9502	0.2999E-04	-0.1879E-05	0.4608	0.3157	0.911E-02
0.200	0.6895	0.1999E-04	-0.6010E-05	0.3572	0.2900	0.311E-01
0.100	0.3874	0.9999E-05	-0.2970E-05	0.2537	0.2581	0.194E-01

NA = 0.1500 XW/U = 0.4000 WT = 4.7124

PROFILE COEFFICIENTS -0.22189 0.01119 0.65466 11.84700 -45.35200 64.35400 -41.59500 10.31900

RE(DELTA) = 1200.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.3540	0.4999E-03	0.1933E-04	0.5189	0.4431	-0.889E-02
0.500	1.1598	0.4166E-03	0.5666E-05	0.5090	0.4311	-0.193E-02
0.450	1.0610	0.3750E-03	0.8333E-06	0.5040	0.4241	-0.475E-03
0.400	0.9614	0.3333E-03	0.1500E-05	0.5002	0.4160	-0.936E-03
0.350	0.8611	0.2916E-03	0.5333E-05	0.4964	0.4064	-0.368E-02

RE(DELTA) = 1835.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.3124	0.2997E-03	0.9427E-05	0.5027	0.4190	-0.662E-02
0.500	1.2123	0.2724E-03	-0.2724E-06	0.4915	0.4124	0.202E-03
0.450	1.1089	0.2452E-03	-0.6648E-05	0.4803	0.4058	0.528E-02
0.400	1.0041	0.2179E-03	-0.9972E-05	0.4715	0.3983	0.859E-02
0.350	0.8968	0.1907E-03	-0.1002E-04	0.4649	0.3902	0.953E-02
0.300	0.7890	0.1634E-03	-0.6920E-05	0.4608	0.3802	0.741E-02
0.250	0.6798	0.1362E-03	-0.1634E-05	0.4519	0.3677	0.199E-02
0.200	0.5677	0.1089E-03	0.6376E-05	0.4430	0.3522	-0.913E-02

RE(DELTA) = 3010.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.500	1.2649	0.1661E-03	0.1013E-04	0.5040	0.3952	-0.121E-01
0.450	1.1635	0.1495E-03	0.7973E-06	0.4817	0.3867	-0.993E-03
0.400	1.0572	0.1328E-03	-0.5946E-05	0.4593	0.3783	0.777E-02
0.350	0.9457	0.1162E-03	-0.9667E-05	0.4410	0.3700	0.135E-01
0.300	0.8304	0.9966E-04	-0.1086E-04	0.4295	0.3612	0.169E-01
0.250	0.7129	0.8305E-04	-0.9202E-05	0.4209	0.3506	0.163E-01
0.200	0.5928	0.6644E-04	-0.5249E-05	0.4149	0.3373	0.110E-01
0.150	0.4719	0.4983E-04	0.1029E-05	0.4089	0.3178	-0.268E-02

RE(DELTA) = 5000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.450	1.1879	0.9000E-04	0.1101E-04	0.5884	0.3788	-0.272E-01
0.400	1.0997	0.7999E-04	0.3659E-05	0.5199	0.3637	-0.865E-02
0.350	0.9940	0.6999E-04	-0.2480E-05	0.4514	0.3521	0.563E-02
0.300	0.8777	0.5999E-04	-0.6379E-05	0.4160	0.3418	0.151E-01
0.250	0.7534	0.5000E-04	-0.8000E-05	0.3964	0.3318	0.210E-01
0.200	0.6254	0.3999E-04	-0.6959E-05	0.3842	0.3197	0.213E-01
0.150	0.4931	0.2999E-04	-0.4020E-05	0.3742	0.3041	0.152E-01
0.100	0.3582	0.1999E-04	0.1079E-05	0.3642	0.2791	-0.549E-02

RE(DELTA) = 10000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.400	1.0762	0.3999E-04	0.5699E-05	0.6674	0.3716	-0.353E-01
0.300	0.9172	0.2999E-04	0.1569E-05	0.5224	0.3270	-0.894E-02
0.200	0.6768	0.1999E-04	-0.3950E-05	0.3774	0.2955	0.220E-01
0.100	0.3818	0.9999E-05	-0.1920E-05	0.2325	0.2619	0.116E-01

NA = 0.1500 XW/U = 0.4000 WT = 5.4978

PROFILE COEFFICIENTS 0.06558 -0.84832 2.38280 7.38390 -37.09300 55.94400 -37.19500 9.37650

RE(DELTA) = 1200.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.4335	0.5416E-03	0.5649E-04	0.5197	0.4534	-0.245E-01
0.600	1.3369	0.4999E-03	0.4449E-04	0.5200	0.4487	-0.207E-01
0.550	1.2412	0.4583E-03	0.3524E-04	0.5202	0.4431	-0.177E-01
0.500	1.1447	0.4166E-03	0.2908E-04	0.5136	0.4367	-0.156E-01
0.450	1.0465	0.3750E-03	0.2641E-04	0.5086	0.4300	-0.154E-01
0.400	0.9481	0.3333E-03	0.2683E-04	0.5045	0.4218	-0.171E-01
0.350	0.8483	0.2916E-03	0.2974E-04	0.4970	0.4125	-0.209E-01
0.300	0.7469	0.2499E-03	0.3550E-04	0.4930	0.4016	-0.281E-01
0.250	0.6455	0.2083E-03	0.4241E-04	0.4837	0.3872	-0.381E-01
0.200	0.5401	0.1666E-03	0.5108E-04	0.4743	0.3703	-0.538E-01

RE(DELTA) = 1835.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5001	0.3542E-03	0.5231E-04	0.5257	0.4333	-0.336E-01
0.600	1.4037	0.3269E-03	0.3634E-04	0.5100	0.4274	-0.242E-01
0.550	1.3040	0.2997E-03	0.2397E-04	0.4944	0.4217	-0.166E-01
0.500	1.2014	0.2724E-03	0.1504E-04	0.4852	0.4161	-0.111E-01
0.450	1.0979	0.2452E-03	0.9155E-05	0.4782	0.4098	-0.731E-02
0.400	0.9923	0.2179E-03	0.6212E-05	0.4701	0.4031	-0.540E-02
0.350	0.8852	0.1907E-03	0.5776E-05	0.4697	0.3953	-0.562E-02
0.300	0.7794	0.1634E-03	0.8501E-05	0.4650	0.3849	-0.930E-02
0.250	0.6701	0.1362E-03	0.1297E-04	0.4603	0.3730	-0.163E-01

RE(DELTA) = 3010.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.500	1.2710	0.1661E-03	0.1823E-04	0.4693	0.3933	-0.202E-01
0.450	1.1643	0.1495E-03	0.8837E-05	0.4563	0.3864	-0.104E-01
0.400	1.0517	0.1328E-03	0.2425E-05	0.4432	0.3803	-0.307E-02
0.350	0.9387	0.1162E-03	-0.7641E-06	0.4388	0.3728	0.107E-02
0.300	0.8238	0.9966E-04	-0.1926E-05	0.4305	0.3641	0.303E-02
0.250	0.7064	0.8305E-04	-0.4318E-06	0.4237	0.3539	0.779E-03
0.200	0.5878	0.6644E-04	0.3056E-05	0.4169	0.3402	-0.652E-02

NA = 0.1500 XW/U = 0.8000 WT = 0.0000

PROFILE COEFFICIENTS 0.46111 -2.19800 7.03310 -11.65000 8.86860 -2.49720 0.00000 0.00000

RE(DELTA) = 1700.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.381[illegible]	0.3529E-03	0.6147E-04	0.4943	0.4343	-0.373E-01
0.550	1.2793	0.3235E-03	0.5052E-04	0.4880	0.4299	-0.327E-01
0.500	1.1765	0.2941E-03	0.4229E-04	0.4817	0.4249	-0.294E-01
0.450	1.0717	0.2647E-03	0.3735E-04	0.4782	0.4198	-0.283E-01
0.400	0.9674	0.2352E-03	0.3458E-04	0.4768	0.4134	-0.289E-01
0.350	0.8620	0.2058E-03	0.3435E-04	0.4732	0.4060	-0.320E-01
0.300	0.7561	0.1764E-03	0.3576E-04	0.4679	0.3967	-0.376E-01
0.250	0.6483	0.1470E-03	0.3911E-04	0.4577	0.3856	-0.469E-01
0.200	0.5376	0.1176E-03	0.4311E-04	0.4475	0.3720	-0.610E-01

RE(DELTA) = 2600.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.3621	0.2115E-03	0.4019E-04	0.4537	0.4037	-0.348E-01
0.500	1.2519	0.1923E-03	0.2984E-04	0.4482	0.3993	-0.277E-01
0.450	1.1390	0.1730E-03	0.2242E-04	0.4428	0.3950	-0.226E-01
0.400	1.0261	0.1538E-03	0.1761E-04	0.4409	0.3898	-0.196E-01
0.350	0.9122	0.1346E-03	0.1526E-04	0.4384	0.3836	-0.190E-01
0.300	0.7980	0.1153E-03	0.1499E-04	0.4353	0.3759	-0.212E-01
0.250	0.6825	0.9615E-04	0.1669E-04	0.4299	0.3663	-0.273E-01
0.200	0.5654	0.7692E-04	0.1973E-04	0.4245	0.3537	-0.385E-01

RE(DELTA) = 4260.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.4699	0.1291E-03	0.4431E-04	0.4219	0.3741	-0.541E-01
0.500	1.3504	0.1179E-03	0.2978E-04	0.4153	0.3702	-0.390E-01
0.450	1.2291	0.1056E-03	0.1950E-04	0.4086	0.3661	-0.276E-01
0.400	1.1057	0.9389E-04	0.1220E-04	0.4035	0.3617	-0.189E-01
0.350	0.9813	0.8215E-04	0.7746E-05	0.3998	0.3566	-0.134E-01
0.300	0.8556	0.7042E-04	0.5399E-05	0.3968	0.3506	-0.106E-01
0.250	0.7293	0.5868E-04	0.5164E-05	0.3935	0.3427	-0.118E-01
0.200	0.6015	0.4694E-04	0.6572E-05	0.3902	0.3325	-0.181E-01

NA = 0.1500 XW/U = 0.8000 WT = 1.5708

PROFILE COEFFICIENTS 0.27016 -0.01106 0.09439 2.96560 -16.96600 28.01300 -19.06900 4.71930

RE(DELTA) = 1700.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.4155	0.3529E-03	0.3064E-04	0.4854	0. 238	-0.178E-01
0.550	1.3122	0.3235E-03	0.2535E-04	0.4842	0.4191	-0.159E-01
0.500	1.2090	0.2941E-03	0.2152E-04	0.4830	0.4135	-0.146E-01
0.450	1.1052	0.2647E-03	0.2017E-04	0.4798	0.4071	-0.148E-01
0.400	1.0006	0.2352E-03	0.2111E-04	0.4755	0.3997	-0.170E-01
0.350	0.8949	0.2058E-03	0.2409E-04	0.4717	0.3911	-0.215E-01
0.300	0.7886	0.1764E-03	0.2811E-04	0.4653	0.3804	-0.282E-01
0.250	0.6800	0.1470E-03	0.3447E-04	0.4532	0.3676	-0.390E-01
0.200	0.5679	0.1176E-03	0.4117E-04	0.4410	0.3521	-0.543E-01

RE(DELTA) = 2600.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.4980	0.2307E-03	0.2329E-04	0.4537	0.4005	-0.182E-01
0.550	1.3886	0.2115E-03	0.1542E-04	0.4523	0.3960	-0.130E-01
0.500	1.2769	0.1923E-03	0.9307E-05	0.4508	0.3915	-0.854E-02
0.450	1.1668	0.1730E-03	0.5538E-05	0.4479	0.3856	-0.552E-02
0.400	1.0536	0.1538E-03	0.4115E-05	0.4415	0.3796	-0.448E-02
0.350	0.9403	0.1346E-03	0.4615E-05	0.4384	0.3722	-0.559E-02
0.300	0.8255	0.1153E-03	0.6999E-05	0.4353	0.3634	-0.959E-02

RE(DELTA) = 4260.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.4803	0.1291E-03	0.1875E-04	0.4321	0.3715	-0.233E-01
0.450	1.2469	0.1056E-03	0.3873E-05	0.4158	0.3608	-0.550E-02
0.400	1.1249	0.9389E-04	0.7042E-07	0.4076	0.3556	-0.108E-03
0.350	1.0016	0.8215E-04	-0.1971E-05	0.4043	0.3494	0.339E-02
0.300	0.8775	0.7042E-04	-0.1995E-05	0.3998	0.3418	0.387E-02
0.250	0.7515	0.5868E-04	-0.3755E-06	0.3940	0.3326	0.838E-03
0.200	0.6237	0.4694E-04	0.2723E-05	0.3881	0.3206	-0.721E-02

NA = 0.1500   XW/U = 0.8000   WT = 3.1416

PROFILE COEFFICIENTS -0.50049 2.14610 0.89275 -11.53700 16.46300 -9.41120 1.96410 0.00000

RE(DELTA) = 1000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.3981	0.5999E-03	0.5899E-05	0.4321	0.4291	-0.182E-02
0.550	1.2984	0.5499E-03	0.2999E-05	0.5007	0.4235	-0.115E-02
0.500	1.1984	0.5000E-03	0.3300E-05	0.5693	0.4172	-0.156E-02

RE(DELTA) = 1100.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.4133	0.5454E-03	-0.1272E-05	0.4321	0.4245	0.428E-03
0.500	1.2106	0.4545E-03	-0.5636E-05	0.4902	0.4130	0.251E-02
0.450	1.1083	0.4090E-03	-0.3000E-05	0.5193	0.4060	0.154E-02

RE(DELTA) = 1300.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.6454	0.5384E-03	0.1176E-04	0.4991	0.4254	-0.464E-02
0.650	1.5438	0.5000E-03	-0.1538E-06	0.4906	0.4210	0.635E-04
0.600	1.4416	0.4615E-03	-0.9153E-05	0.4822	0.4162	0.398E-02
0.550	1.3364	0.4230E-03	-0.1392E-04	0.4780	0.4115	0.647E-02
0.500	1.2324	0.3846E-03	-0.1600E-04	0.4778	0.4057	0.806E-02
0.450	1.1271	0.3461E-03	-0.1476E-04	0.4764	0.3992	0.811E-02
0.400	1.0225	0.3076E-03	-0.1092E-04	0.4750	0.3911	0.659E-02

RE(DELTA) = 1700.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5902	0.3823E-03	-0.7058E-06	0.4760	0.4087	0.359E-03
0.600	1.4846	0.3529E-03	-0.1117E-04	0.4699	0.4041	0.601E-02
0.550	1.3774	0.3235E-03	-0.1852E-04	0.4636	0.3993	0.106E-01
0.500	1.2690	0.2941E-03	-0.2258E-04	0.4595	0.3940	0.139E-01
0.450	1.1598	0.2647E-03	-0.2382E-04	0.4566	0.3879	0.159E-01
0.400	1.0500	0.2352E-03	-0.2217E-04	0.4541	0.3809	0.163E-01
0.350	0.9396	0.2058E-03	-0.1788E-04	0.4528	0.3724	0.146E-01
0.300	0.8292	0.1764E-03	-0.1094E-04	0.4500	0.3617	0.100E-01
0.250	0.7174	0.1470E-03	-0.1764E-05	0.4415	0.3484	0.184E-02
0.200	0.6027	0.1176E-03	0.9411E-05	0.4330	0.3318	-0.114E-01

RE(DELTA) = 2600.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.5499	0.2307E-03	-0.1807E-05	0.4656	0.3871	0.141E-02
0.550	1.4413	0.2115E-03	-0.1153E-04	0.4538	0.3815	0.944E-02
0.500	1.3295	0.1923E-03	-0.1849E-04	0.4419	0.3760	0.159E-01
0.450	1.2150	0.1730E-03	-0.2276E-04	0.4334	0.3703	0.211E-01
0.400	1.0988	0.1538E-03	-0.2465E-04	0.4245	0.3640	0.247E-01
0.350	0.9794	0.1346E-03	-0.2380E-04	0.4226	0.3573	0.267E-01
0.300	0.8622	0.1153E-03	-0.2026E-04	0.4226	0.3479	0.258E-01
0.250	0.7428	0.9615E-04	-0.1469E-04	0.4149	0.3365	0.213E-01
0.200	0.6212	0.7692E-04	-0.6961E-05	0.4091	0.3219	0.119E-01
0.150	0.4984	0.5764E-04	0.2269E-05	0.4033	0.3009	-0.477E-02

RE(DELTA) = 4260.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.4911	0.1291E-03	0.2417E-05	0.4938	0.3688	-0.341E-02
0.500	1.3877	0.1173E-03	-0.5633E-05	0.4630	0.3603	0.800E-02
0.450	1.2747	0.1056E-03	-0.1215E-04	0.4322	0.3530	0.175E-01
0.400	1.1562	0.9389E-04	-0.1640E-04	0.4130	0.3459	0.249E-01
0.350	1.0325	0.8215E-04	-0.1863E-04	0.4011	0.3389	0.308E-01
0.300	0.9069	0.7042E-04	-0.1854E-04	0.3931	0.3307	0.342E-01
0.250	0.778[illegible]	0.5868E-04	-0.1631E-04	0.3859	0.3212	0.344E-01
0.200	0.647[illegible]	0.4694E-04	-0.1225E-04	0.3788	0.3087	0.309E-01
0.150	0.5141	0.3521E-04	-0.6173E-05	0.3717	0.2917	0.190E-01
0.100	0.3788	0.2347E-04	0.1150E-05	0.3646	0.2639	-0.471E-02

RE(DELTA) = 10000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.500	1.3897	0.5000E-04	0.2109E-05	0.5794	0.3597	-0.879E-02
0.400	1.2034	0.3999E-04	-0.2310E-05	0.4925	0.3323	0.945E-02
0.300	0.9804	0.2999E-04	-0.7370E-05	0.4057	0.3059	0.304E-01
0.200	0.7049	0.1999E-04	-0.8700E-05	0.3461	0.2837	0.427E-01
0.100	0.4013	0.9999E-05	-0.3789E-05	0.2866	0.2491	0.270E-01

NA = 0.1500   XW/U = 0.8000   WT = 3.9270

PROFILE COEFFICIENTS -0.65802 1.70530 3.64080 -16.05400 19.86480 -10.04500 1.10790 0.45604

RE(DELTA) = 1000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.4043	0.5999E-03	-0.1130E-04	0.4979	0.4272	0.400E-02
0.550	1.3038	0.5499E-03	-0.1680E-04	0.4955	0.4218	0.638E-02
0.500	1.2025	0.5000E-03	-0.1870E-04	0.4930	0.4158	0.766E-02
0.450	1.1010	0.4499E-03	-0.1669E-04	0.4916	0.4087	0.745E-02
0.400	0.9991	0.4000E-03	-0.1119E-04	0.4899	0.4003	0.549E-02
0.350	0.8969	0.3499E-03	-0.2300E-05	0.4873	0.3902	0.124E-02
0.300	0.7939	0.2999E-03	0.9600E-05	0.4847	0.3778	-0.586E-02

RE(DELTA) = 1700.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5899	0.3823E-03	-0.7058E-06	0.4892	0.4088	0.369E-03
0.600	1.4863	0.3529E-03	-0.1394E-04	0.4753	0.4036	0.758E-02
0.550	1.3795	0.3235E-03	-0.2405E-04	0.4615	0.3986	0.136E-01
0.500	1.2696	0.2941E-03	-0.3047E-04	0.4611	0.3938	0.188E-01
0.450	1.1626	0.2647E-03	-0.3347E-04	0.4610	0.3870	0.225E-01
0.350	0.9396	0.2058E-03	-0.3023E-04	0.4503	0.3724	0.246E-01
0.300	0.8288	0.1764E-03	-0.2370E-04	0.4480	0.3619	0.217E-01
0.250	0.7164	0.1470E-03	-0.1470E-04	0.4421	0.3489	0.154E-01
0.200	0.6026	0.1176E-03	-0.3176E-05	0.4324	0.3318	0.387E-02
0.150	0.4851	0.8823E-04	0.1035E-04	0.4227	0.3092	-0.153E-01

RE(DELTA) = 2600.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.5366	0.2307E-03	0.7692E-07	0.4847	0.3904	-0.630E-04
0.550	1.4334	0.2115E-03	-0.1111E-04	0.4693	0.3837	0.946E-02
0.500	1.3233	0.1923E-03	-0.2007E-04	0.4539	0.3778	0.179E-01
0.450	1.2131	0.1730E-03	-0.2600E-04	0.4438	0.3709	0.247E-01
0.400	1.0979	0.1538E-03	-0.2930E-04	0.4295	0.3643	0.298E-01
0.350	0.9803	0.1346E-03	-0.2957E-04	0.4226	0.3570	0.331E-01
0.300	0.8613	0.1153E-03	-0.2711E-04	0.4184	0.3483	0.342E-01
0.250	0.7413	0.9615E-04	-0.2219E-04	0.4144	0.3372	0.322E-01
0.200	0.6200	0.7692E-04	-0.1453E-04	0.4067	0.3225	0.247E-01
0.150	0.4954	0.5769E-04	-0.4961E-05	0.3965	0.3027	0.103E-01
0.100	0.3678	0.3846E-04	0.6307E-05	0.3863	0.2718	-0.172E-01

RE(DELTA) = 4260.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.4588	0.1291E-03	0.2347E-05	0.5485	0.3770	-0.376E-02
0.500	1.3643	0.1173E-03	-0.5140E-05	0.5056	0.3664	0.811E-02
0.450	1.2606	0.1056E-03	-0.1183E-04	0.4627	0.3569	0.184E-01
0.400	1.1478	0.9389E-04	-0.1690E-04	0.4311	0.3484	0.270E-01
0.350	1.0285	0.8215E-04	-0.2028E-04	0.4105	0.3403	0.344E-01
0.300	0.9041	0.7042E-04	-0.2115E-04	0.3940	0.3318	0.392E-01
0.250	0.7746	0.5868E-04	-0.1983E-04	0.3849	0.3227	0.419E-01
0.200	0.6443	0.4694E-04	-0.1629E-04	0.3815	0.3104	0.410E-01
0.150	0.5125	0.3521E-04	-0.1011E-04	0.3745	0.2926	0.314E-01
0.100	0.3771	0.2347E-04	-0.2488E-05	0.3670	0.2651	0.103E-01

RE(DELTA) = 10000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.500	1.3610	0.5000E-04	-0.1999E-06	0.5701	0.3673	0.837E-03
0.400	1.1704	0.3999E-04	-0.3749E-05	0.4994	0.3417	0.160E-01
0.300	0.9595	0.2999E-04	-0.7550E-05	0.4286	0.3126	0.337E-01
0.200	0.6985	0.1999E-04	-0.9419E-05	0.3581	0.2863	0.483E-01
0.100	0.3984	0.9999E-05	-0.5070E-05	0.2877	0.2510	0.366E-01

NA = 0.1500 XW/U = 0.8000 WT = 4.7124

PROFILE COEFFICIENTS -0.39091 0.01923 5.28010 -7.25980 -9.36030 28.22400 -22.87300 6.37790

RE(DELTA) = 900.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.2471	0.6111E-03	0.3777E-05	0.5701	0.4410	-0.155E-02
0.500	1.1526	0.5555E-03	0.1000E-05	0.5222	0.4338	-0.407E-03
0.450	1.0556	0.5000E-03	0.2222E-05	0.4743	0.4262	-0.898E-03

RE(DELTA) = 1200.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.3853	0.4999E-03	-0.7500E-06	0.5052	0.4331	0.328E-03
0.500	1.1861	0.4166E-03	-0.1491E-04	0.4976	0.4215	0.751E-02
0.400	0.9834	0.3333E-03	-0.1474E-04	0.4900	0.4067	0.882E-02
0.300	0.7780	0.2499E-03	-0.1500E-05	0.4805	0.3856	0.111E-02
0.200	0.5671	0.1666E-03	0.2250E-04	0.4509	0.3526	-0.214E-01
0.100	0.3333	0.8333E-04	0.5350E-04	0.4213	0.3000	-0.811E-01

RE(DELTA) = 1700.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5292	0.3823E-03	0.1764E-04	0.5222	0.4250	-0.102E-01
0.600	1.4322	0.3529E-03	0.2941E-05	0.5067	0.4189	-0.176E-02
0.550	1.3318	0.3235E-03	-0.8470E-05	0.4912	0.4129	0.531E-02
0.500	1.2286	0.2941E-03	-0.16[illegible]7E-04	0.4805	0.4069	0.109E-01
0.450	1.1237	0.2647E-03	-0.2129E-04	0.4726	0.4004	0.152E-01
0.400	1.0170	0.2352E-03	-0.2264E-04	0.4668	0.3933	0.176E-01
0.350	0.9095	0.2058E-03	-0.2111E-04	0.4625	0.3848	0.182E-01
0.300	0.8008	0.1764E-03	-0.1623E-04	0.4583	0.3746	0.157E-01
0.250	0.6913	0.1470E-03	-0.8999E-05	0.4533	0.3616	0.100E-01
0.200	0.5802	0.1176E-03	0.8823E-06	0.4483	0.3447	-0.115E-02

RE(DELTA) = 2600.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5527	0.2500E-03	0.2880E-04	0.6169	0.4186	-0.297E-01
0.600	1.4689	0.2307E-03	0.1553E-04	0.5686	0.4084	-0.156E-01
0.550	1.3764	0.2115E-03	0.3384E-05	0.5202	0.3995	-0.332E-02
0.500	1.2764	0.1923E-03	-0.6653E-05	0.4867	0.3917	0.659E-02
0.450	1.1708	0.1730E-03	-0.1411E-04	0.4642	0.3843	0.149E-01
0.400	1.0609	0.1538E-03	-0.1880E-04	0.4493	0.3770	0.207E-01
0.350	0.9482	0.1346E-03	-0.2065E-04	0.4392	0.3691	0.248E-01
0.300	0.8332	0.1153E-03	-0.1969E-04	0.4317	0.3600	0.265E-01
0.250	0.7166	0.9615E-04	-0.1607E-04	0.4260	0.3488	0.248E-01
0.200	0.5985	0.7692E-04	-0.9884E-05	0.4194	0.3341	0.180E-01
0.150	0.4782	0.5769E-04	-0.1576E-05	0.4062	0.3136	0.348E-02
0.100	0.3522	0.3846E-04	0.8115E-05	0.3929	0.2839	-0.235E-01

RE(DELTA) = 4160.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.4558	0.1408E-03	0.1734E-04	0.6936	0.4121	-0.352E-01
0.550	1.3801	0.1291E-03	0.1180E-04	0.6381	0.3985	-0.232E-01
0.500	1.2989	0.1173E-03	0.5258E-05	0.5826	0.3849	-0.100E-01
0.450	1.2079	0.1056E-03	-0.1784E-05	0.5106	0.3725	0.326E-02
0.400	1.1054	0.9389E-04	-0.7887E-05	0.4673	0.3618	0.142E-01
0.350	0.9935	0.8215E-04	-0.1251E-04	0.4343	0.3522	0.233E-01
0.300	0.8750	0.7042E-04	-0.1448E-04	0.4120	0.3428	0.290E-01
0.250	0.7507	0.5868E-04	-0.1455E-04	0.4008	0.3330	0.331E-01
0.200	0.6255	0.4694E-04	-0.1173E-04	0.3922	0.3197	0.313E-01
0.150	0.4957	0.3521E-04	-0.7018E-05	0.3802	0.3026	0.229E-01
0.100	0.3625	0.2347E-04	-0.3990E-06	0.3570	0.2758	0.167E-02
0.050	0.2149	0.1173E-04	0.6854E-05	0.3338	0.2326	-0.453E-01

RE(DELTA) = 10000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.400	1.1074	0.3999E-04	0.4699E-06	0.5744	0.3612	-0.243E-02
0.300	0.9217	0.2999E-04	-0.3019E-05	0.4758	0.3254	0.155E-01
0.200	0.6797	0.1999E-04	-0.6399E-05	0.3773	0.2942	0.355E-01
0.100	0.3868	0.9999E-05	-0.3499E-05	0.2787	0.2585	0.252E-01

NA = 0.1500 XW/U = 0.8000 WT = 5.4978

PROFILE COEFFICIENTS 0.12642 -1.67910 4.86320 6.07238 -43.30500 68.89100 -47.04100 12.08900

RE(DELTA) = 1700.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.3734	0.3529E-03	0.3276E-04	0.5265	0.4368	-0.213E-01
0.550	1.2779	0.3235E-03	0.2135E-04	0.5125	0.4303	-0.145E-01
0.500	1.1782	0.2941E-03	0.1294E-04	0.4985	0.4243	-0.930E-02
0.450	1.0773	0.2647E-03	0.7411E-05	0.4909	0.4177	-0.574E-02
0.400	0.9745	0.2352E-03	0.5058E-05	0.4856	0.4104	-0.428E-02
0.350	0.8714	0.2058E-03	0.5235E-05	0.4808	0.4016	-0.491E-02
0.300	0.7665	0.1764E-03	0.8294E-05	0.4750	0.3913	-0.873E-02
0.250	0.6609	0.1470E-03	0.1323E-04	0.4671	0.3782	-0.159E-01
0.200	0.5524	0.1176E-03	0.2041E-04	0.4532	0.3620	-0.284E-01
0.150	0.4402	0.8823E-04	0.2794E-04	0.4393	0.3407	-0.474E-01

RE(DELTA) = 2600.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.4161	0.2307E-03	0.4096E-04	0.5791	0.4236	-0.435E-01
0.550	1.3277	0.2115E-03	0.2669E-04	0.5400	0.4142	-0.282E-01
0.500	1.2305	0.1923E-03	0.1526E-04	0.5008	0.4063	-0.161E-01
0.450	1.1279	0.1730E-03	0.6807E-05	0.4779	0.3989	-0.750E-02
0.400	1.0212	0.1538E-03	0.1269E-05	0.4632	0.3916	-0.149E-02
0.350	0.9120	0.1346E-03	-0.1500E-05	0.4537	0.3837	0.194E-02
0.300	0.8008	0.1153E-03	-0.1653E-05	0.4462	0.3746	0.239E-02
0.250	0.6879	0.9615E-04	0.5769E-06	0.4393	0.3634	-0.958E-03
0.200	0.5732	0.7692E-04	0.4846E-05	0.4303	0.3489	-0.946E-02
0.150	0.4555	0.5769E-04	0.1069E-04	0.4213	0.3293	-0.257E-01

RE(DELTA) = 4260.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.3178	0.1291E-03	0.3483E-04	0.9032	0.4173	-0.101E 00
0.500	1.2590	0.1173E-03	0.2570E-04	0.7278	0.3971	-0.633E-01
0.450	1.1764	0.1056E-03	0.1518E-04	0.5524	0.3825	-0.303E-01
0.400	1.0763	0.7389E-04	0.6690E-05	0.4749	0.3716	-0.125E-01
0.350	0.9653	0.8215E-04	0.6338E-06	0.4374	0.3625	-0.122E-02
0.300	0.8475	0.7042E-04	-0.2394E-05	0.4191	0.3539	0.504E-02
0.250	0.7267	0.5868E-04	-0.3239E-05	0.4085	0.3440	0.775E-02
0.200	0.6027	0.4694E-04	-0.1572E-05	0.3997	0.3318	0.444E-02
0.150	0.4765	0.3521E-04	0.1619E-05	0.3908	0.3147	-0.565E-02

RE(DELTA) = 10000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.300	0.9207	0.2999E-04	0.5249E-05	0.4460	0.3258	-0.254E-01
0.250	0.8059	0.2500E-04	0.6000E-06	0.4019	0.3102	-0.299E-02
0.200	0.6702	0.1999E-04	-0.1609E-05	0.3579	0.2984	0.859E-02
0.150	0.5263	0.1499E-04	-0.1670E-05	0.3386	0.2850	0.107E-01
0.100	0.3747	0.9999E-05	0.1999E-07	0.3193	0.2668	-0.170E-03

NA = 0.1500 XW/U = 1.4000 WT = 0.0000

PROFILE COEFFICIENTS 0.61392 -3.78070 10.52400 -7.56770 -18.92100 41.97600 -30.95200 8.12470

RE(DELTA) = 2250.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.2869	0.2444E-03	0.4466E-04	0.5005	0.4273	-0.390E-01
0.500	1.1857	0.2222E-03	0.3413E-04	0.4874	0.4216	-0.315E-01
0.450	1.0817	0.2000E-03	0.2631E-04	0.4742	0.4160	-0.259E-01
0.400	0.9748	0.1777E-03	0.2146E-04	0.4670	0.4103	-0.231E-01
0.350	0.8676	0.1555E-03	0.1888E-04	0.4625	0.4034	-0.226E-01
0.300	0.7586	0.1333E-03	0.1875E-04	0.4568	0.3954	-0.254E-01
0.250	0.6487	0.1111E-03	0.2013E-04	0.4495	0.3853	-0.313E-01
0.200	0.5361	0.8888E-04	0.2324E-04	0.4421	0.3730	-0.431E-01

RE(DELTA) = 3440.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.3543	0.1598E-03	0.5093E-04	0.5016	0.4061	-0.648E-01
0.500	1.2527	0.1453E-03	0.3534E-04	0.4786	0.3991	-0.464E-01
0.450	1.1452	0.1308E-03	0.2436E-04	0.4555	0.3929	-0.333E-01
0.400	1.0331	0.1162E-03	0.1656E-04	0.4413	0.3871	-0.243E-01
0.350	0.9186	0.1017E-03	0.1186E-04	0.4321	0.3810	-0.191E-01
0.300	0.8017	0.8720E-04	0.9331E-05	0.4259	0.3742	-0.170E-01
0.250	0.6838	0.7267E-04	0.9098E-05	0.4193	0.3656	-0.191E-01
0.200	0.5632	0.5813E-04	0.1043E-04	0.4127	0.3551	-0.263E-01

RE(DELTA) = 5640.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.400	1.1113	0.7092E-04	0.1955E-04	0.4128	0.3599	-0.409E-01
0.350	0.9891	0.6205E-04	0.1152E-04	0.4022	0.3538	-0.264E-01
0.300	0.8626	0.5319E-04	0.6719E-05	0.3915	0.3477	-0.172E-01
0.250	0.7337	0.4432E-04	0.4290E-05	0.3842	0.3407	-0.126E-01
0.200	0.6023	0.3546E-04	0.4024E-05	0.3768	0.3320	-0.142E-01

NA = 0.1500 XW/U = 1.4000 WT = 1.5708

PROFILE COEFFICIENTS 0.39757 0.02366 -2.06390 7.05560 -17.85200 24.54600 -16.13800 4.04780

RE(DELTA) = 2250.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.4868	0.2666E-03	0.3759E-04	0.4538	0.4035	-0.258E-01
0.550	1.3757	0.2444E-03	0.2999E-04	0.4500	0.3997	-0.220E-01
0.500	1.2646	0.2222E-03	0.2457E-04	0.4462	0.3953	-0.195E-01
0.450	1.1516	0.2000E-03	0.2155E-04	0.4446	0.3907	-0.187E-01
0.400	1.0397	0.1777E-03	0.2039E-04	0.4448	0.3847	-0.196E-01
0.350	0.9268	0.1555E-03	0.2120E-04	0.4428	0.3776	-0.227E-01
0.300	0.8139	0.1333E-03	0.2346E-04	0.4393	0.3685	-0.285E-01
0.250	0.6992	0.1111E-03	0.2724E-04	0.4314	0.3575	-0.378E-01
0.200	0.5821	0.8888E-04	0.3173E-04	0.4235	0.3435	-0.519E-01

RE(DELTA) = 3440.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.5870	0.1744E-03	0.3171E-04	0.4209	0.3780	-0.289E-01
0.550	1.4684	0.1598E-03	0.2241E-04	0.4162	0.3745	-0.218E-01
0.500	1.3467	0.1453E-03	0.1520E-04	0.4115	0.3712	-0.159E-01
0.450	1.2254	0.1308E-03	0.1029E-04	0.4110	0.3672	-0.118E-01
0.400	1.1034	0.1162E-03	0.7383E-05	0.4101	0.3625	-0.944E-02
0.350	0.9816	0.1017E-03	0.6424E-05	0.4093	0.3565	-0.921E-02
0.300	0.8591	0.8720E-04	0.7151E-05	0.4074	0.3492	-0.116E-01
0.250	0.7362	0.7267E-04	0.9360E-05	0.4038	0.3395	-0.176E-01
0.200	0.6115	0.5813E-04	0.1281E-04	0.4002	0.3270	-0.288E-01

RE(DELTA) = 5640.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.5820	0.9751E-04	0.2549E-04	0.3904	0.3476	-0.354E-01
0.500	1.4532	0.8865E-04	0.1581E-04	0.3845	0.3440	-0.236E-01
0.450	1.3219	0.7978E-04	0.9865E-05	0.3785	0.3404	-0.143E-01
0.400	1.1890	0.7092E-04	0.4060E-05	0.3746	0.3364	-0.721E-02
0.350	1.0550	0.6205E-04	0.1276E-05	0.3724	0.3317	-0.254E-02
0.300	0.9205	0.5319E-04	0.1773E-06	0.3710	0.3259	-0.403E-03
0.250	0.7855	0.4432E-04	0.6914E-06	0.3692	0.3182	-0.183E-02
0.200	0.6497	0.3546E-04	0.2535E-05	0.3674	0.3078	-0.808E-02

NA = 0.1500 XW/U = 1.4000 WT = 3.1416

PROFILE COEFFICIENTS -0.62960 3.77740 -6.02780 5.38900 -9.95640 15.96300 -11.47600 2.97760

RE(DELTA) = 1000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.6105	0.6999E-03	0.1519E-04	0.5045	0.4345	-0.476E-02
0.600	1.4131	0.5999E-03	0.1299E-05	0.5048	0.4245	-0.464E-03
0.550	1.3139	0.5499E-03	-0.1200E-05	0.5050	0.4186	0.461E-03
0.500	1.2151	0.5000E-03	0.9999E-07	0.5030	0.4114	-0.414E-04
0.400	1.0139	0.4000E-03	0.1210E-04	0.4990	0.3945	-0.595E-02

RE(DELTA) = 1200.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5449	0.5416E-03	-0.4916E-05	0.4906	0.4207	0.187E-02
0.600	1.4429	0.4999E-03	-0.1158E-04	0.4885	0.4158	0.470E-02
0.550	1.3402	0.4583E-03	-0.1516E-04	0.4863	0.4103	0.660E-02
0.500	1.2373	0.4166E-03	-0.1550E-04	0.4854	0.4041	0.729E-02
0.450	1.1342	0.3750E-03	-0.1266E-04	0.4842	0.3967	0.648E-02
0.400	1.0308	0.3333E-03	-0.6999E-05	0.4826	0.3880	0.393E-02
0.350	0.9270	0.2916E-03	0.1416E-05	0.4809	0.3775	-0.882E-03

RE(DELTA) = 1500.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5847	0.4333E-03	-0.9066E-05	0.4759	0.4101	0.408E-02
0.550	1.3740	0.3666E-03	-0.2279E-04	0.4711	0.4002	0.117E-01
0.450	1.1602	0.3000E-03	-0.2426E-04	0.4664	0.3878	0.146E-01
0.350	0.9452	0.2333E-03	-0.1433E-04	0.4608	0.3702	0.104E-01
0.300	0.8362	0.1999E-03	-0.5933E-05	0.4580	0.3587	0.487E-02

RE(DELTA) = 2250.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.6556	0.2888E-03	-0.1288E-05	0.4708	0.3926	0.824E-03
0.600	1.5483	0.2666E-03	-0.1235E-04	0.4600	0.3875	0.826E-02
0.550	1.4382	0.2444E-03	-0.2035E-04	0.4492	0.3824	0.143E-01
0.500	1.3257	0.2222E-03	-0.2560E-04	0.4420	0.3771	0.192E-01
0.450	1.2120	0.2000E-03	-0.2844E-04	0.4380	0.3712	0.231E-01
0.400	1.0974	0.1777E-03	-0.2822E-04	0.4351	0.3644	0.251E-01
0.350	0.9822	0.1555E-03	-0.2555E-04	0.4329	0.3563	0.253E-01
0.300	0.8664	0.1333E-03	-0.2031E-04	0.4310	0.3462	0.227E-01
0.250	0.7502	0.1111E-03	-0.1288E-04	0.4279	0.3332	0.165E-01
0.200	0.6327	0.8888E-04	-0.3377E-05	0.4202	0.3161	0.504E-02
0.150	0.5122	0.6666E-04	0.7555E-05	0.4125	0.2928	-0.136E-01

RE(DELTA) = 3440.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.7032	0.1889E-03	0.1267E-04	0.5242	0.3816	-0.134E-01
0.600	1.6047	0.1744E-03	0.1308E-05	0.4905	0.3739	-0.137E-02
0.550	1.4991	0.1598E-03	-0.8691E-05	0.4568	0.3668	0.911E-02
0.500	1.3855	0.1453E-03	-0.1595E-04	0.4341	0.3608	0.172E-01
0.450	1.2687	0.1308E-03	-0.2107E-04	0.4218	0.3546	0.241E-01
0.400	1.1484	0.1162E-03	-0.2377E-04	0.4127	0.3483	0.293E-01
0.350	1.0264	0.1017E-03	-0.2415E-04	0.4068	0.3409	0.329E-01
0.300	0.9026	0.8720E-04	-0.2223E-04	0.4027	0.3323	0.341E-01
0.250	0.7781	0.7267E-04	-0.1811E-04	0.3996	0.3212	0.320E-01
0.200	0.6524	0.5813E-04	-0.1191E-04	0.3954	0.3065	0.248E-01
0.150	0.5252	0.4360E-04	-0.3982E-05	0.3911	0.2856	0.102E-01

RE(DELTA) = 5640.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.6099	0.1063E-03	0.9308E-05	0.6110	0.3726	-0.199E-01
0.550	1.5242	0.9751E-04	0.3191E-05	0.5529	0.3608	-0.653E-02
0.500	1.4285	0.8865E-04	-0.3173E-05	0.4948	0.3500	0.620E-02
0.450	1.3215	0.7978E-04	-0.8953E-05	0.4473	0.3405	0.170E-01
0.400	1.2045	0.7092E-04	-0.1343E-04	0.4141	0.3320	0.260E-01
0.350	1.0798	0.6205E-04	-0.1620E-04	0.3927	0.3241	0.332E-01
0.300	0.9498	0.5319E-04	-0.1707E-04	0.3797	0.3158	0.384E-01
0.250	0.8164	0.4432E-04	-0.1599E-04	0.3717	0.3062	0.410E-01
0.200	0.6808	0.3546E-04	-0.1299E-04	0.3661	0.2937	0.394E-01
0.150	0.5433	0.2659E-04	-0.8173E-05	0.3601	0.2760	0.305E-01
0.100	0.4031	0.1773E-04	-0.1914E-05	0.3540	0.2480	0.948E-02

RE(DELTA) = 10000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.500	1.4227	0.5000E-04	0.7599E-06	0.5600	0.3514	-0.299E-02
0.400	1.2318	0.3999E-04	-0.4149E-05	0.4770	0.3247	0.160E-01
0.300	0.9994	0.2999E-04	-0.9040E-05	0.3940	0.3001	0.356E-01
0.200	0.7199	0.1999E-04	-0.9659E-05	0.3440	0.2778	0.461E-01
0.100	0.4171	0.9999E-05	-0.4020E-05	0.2939	0.2397	0.283E-01

NA = 0.1500   XW/U = 1.4000   WT = 3.9270

PROFILE COEFFICIENTS -0.87187 2.96910 -0.35397 -3.47230 -7.60510 22.53100 -18.04800 4.86860

RE(DELTA) = 600.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.5416	0.1166E-02	0.8333E-05	0.5600	0.4540	-0.181E-02
0.630	1.4500	0.1083E-02	0.3666E-05	0.5437	0.4482	-0.825E-03
0.600	1.3577	0.9999E-03	0.2833E-05	0.5274	0.4419	-0.660E-03

RE(DELTA) = 700.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.850	1.8452	0.1214E-02	0.3042E-04	0.5494	0.4606	-0.634E-02
0.800	1.7532	0.1142E-02	0.1128E-04	0.5417	0.4563	-0.244E-02
0.750	1.6606	0.1071E-02	-0.5142E-05	0.5339	0.4516	0.115E-02
0.700	1.5659	0.9999E-03	-0.1571E-04	0.5296	0.4470	0.372E-02
0.650	1.4718	0.9285E-03	-0.2285E-04	0.5291	0.4416	0.575E-02
0.600	1.3769	0.8571E-03	-0.2499E-04	0.5277	0.4357	0.670E-02
0.550	1.2823	0.7857E-03	-0.2357E-04	0.5268	0.4289	0.677E-02
0.500	1.1871	0.7142E-03	-0.1771E-04	0.5252	0.4211	0.548E-02
0.450	1.0919	0.6428E-03	-0.8142E-05	0.5235	0.4121	0.273E-02

RE(DELTA) = 800.

BE R*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.800	1.7770	0.1000E-02	0.1000E-05	0.5386	0.4501	-0.242E-03
0.750	1.6829	0.9375E-03	-0.1562E-04	0.5299	0.4456	0.393E-02
0.700	1.5883	0.8750E-03	-0.2924E-04	0.5212	0.4407	0.767E-02
0.650	1.4910	0.8125E-03	-0.3637E-04	0.5165	0.4359	0.100E-01
0.600	1.3947	0.7499E-03	-0.4050E-04	0.5162	0.4302	0.119E-01
0.550	1.2973	0.6874E-03	-0.4012E-04	0.5149	0.4239	0.127E-01
0.500	1.2005	0.6250E-03	-0.3624E-04	0.5144	0.4164	0.124E-01
0.450	1.1029	0.5625E-03	-0.2825E-04	0.5125	0.4080	0.109E-01
0.400	1.0054	0.5000E-03	-0.1687E-04	0.5107	0.3978	0.685E-02

RE(DELTA) = 1000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.6231	0.6999E-03	-0.3569E-04	0.5085	0.4312	0.111E-01
0.650	1.5247	0.6500E-03	-0.4590E-04	0.5051	0.4263	0.152E-01
0.550	1.3244	0.5499E-03	-0.5490E-04	0.4984	0.4152	0.206E-01
0.500	1.2240	0.5000E-03	-0.5339E-04	0.4965	0.4084	0.216E-01
0.450	1.1230	0.4499E-03	-0.4840E-04	0.4943	0.4007	0.213E-01
0.400	1.0217	0.4000E-03	-0.3989E-04	0.4930	0.3915	0.192E-01
0.350	0.9202	0.3499E-03	-0.2790E-04	0.4903	0.3803	0.148E-01
0.250	0.7144	0.2500E-03	0.5000E-05	0.4849	0.3499	-0.339E-02

RE(DELTA) = 1400.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.800	1.8677	0.5714E-03	0.8214E-05	0.5261	0.4283	-0.323E-02
0.700	1.6750	0.4999E-03	-0.2764E-04	0.5055	0.4179	0.116E-01
0.600	1.4718	0.4285E-03	-0.4978E-04	0.4849	0.4076	0.229E-01
0.500	1.2625	0.3571E-03	-0.5799E-04	0.4737	0.3960	0.304E-01
0.400	1.0496	0.2857E-03	-0.5257E-04	0.4678	0.3810	0.328E-01
0.300	0.8350	0.2142E-03	-0.3428E-04	0.4623	0.3592	0.265E-01
0.200	0.6170	0.1428E-03	-0.4999E-05	0.4397	0.3241	0.498E-02
0.100	0.3794	0.7142E-04	0.3250E-04	0.4172	0.2635	-0.500E-01

RE(DELTA) = 2250.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.7241	0.3111E-03	-0.4666E-05	0.5441	0.4060	0.331E-02
0.650	1.6301	0.2888E-03	-0.1759E-04	0.5174	0.3987	0.125E-01
0.600	1.5307	0.2666E-03	-0.2839E-04	0.4907	0.3919	0.204E-01
0.550	1.4262	0.2444E-03	-0.3728E-04	0.4707	0.3856	0.276E-01
0.500	1.3182	0.2222E-03	-0.4333E-04	0.4571	0.3793	0.338E-01
0.450	1.2074	0.2000E-03	-0.4666E-04	0.4468	0.3727	0.388E-01
0.400	1.0944	0.1777E-03	-0.4706E-04	0.4397	0.3654	0.425E-01
0.350	0.9800	0.1555E-03	-0.4466E-04	0.4349	0.3571	0.446E-01
0.300	0.8645	0.1333E-03	-0.3937E-04	0.4314	0.3470	0.442E-01
0.250	0.7482	0.1111E-03	-0.3142E-04	0.4282	0.3341	0.404E-01
0.200	0.6310	0.8888E-04	-0.2088E-04	0.4228	0.3169	0.314E-01
0.150	0.5117	0.6666E-04	-0.8222E-05	0.4174	0.2931	0.150E-01

NA = 0.1500 XW/U = 1.4000 WT = 3.9270

RE(DELTA) = 3440.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.6436	0.1889E-03	-0.3488E-05	0.5810	0.3954	0.424E-02
0.600	1.5550	0.1744E-03	-0.1110E-04	0.5439	0.3858	0.133E-01
0.550	1.4595	0.1598E-03	-0.1886E-04	0.5068	0.3768	0.225E-01
0.500	1.3575	0.1453E-03	-0.2543E-04	0.4755	0.3683	0.306E-01
0.450	1.2490	0.1308E-03	-0.3052E-04	0.4499	0.3602	0.378E-01
0.400	1.1351	0.1162E-03	-0.3360E-04	0.4311	0.3523	0.439E-01
0.350	1.0170	0.1017E-03	-0.3444E-04	0.4179	0.3441	0.486E-01
0.300	0.8958	0.8720E-04	-0.3293E-04	0.4090	0.3348	0.517E-01
0.250	0.7725	0.7267E-04	-0.2895E-04	0.4029	0.3236	0.519E-01
0.200	0.6476	0.5813E-04	-0.2255E-04	0.3976	0.3088	0.476E-01
0.150	0.5210	0.4360E-04	-0.1389E-04	0.3923	0.2879	0.359E-01

RE(DELTA) = 5640.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.7247	0.1241E-03	0.2482E-05	0.6033	0.4058	-0.489E-02
0.600	1.5529	0.1063E-03	-0.4804E-05	0.5685	0.3863	0.992E-02
0.550	1.4639	0.9751E-04	-0.8297E-05	0.5511	0.3757	0.176E-01
0.500	1.3714	0.8865E-04	-0.1180E-04	0.5258	0.3645	0.255E-01
0.450	1.2736	0.7978E-04	-0.1531E-04	0.4932	0.3533	0.334E-01
0.400	1.1684	0.7092E-04	-0.1852E-04	0.4575	0.3423	0.409E-01
0.350	1.0547	0.6205E-04	-0.2092E-04	0.4253	0.3318	0.475E-01
0.300	0.9330	0.5319E-04	-0.2196E-04	0.4005	0.3215	0.531E-01
0.250	0.8049	0.4432E-04	-0.2122E-04	0.3836	0.3105	0.570E-01
0.200	0.6723	0.3546E-04	-0.1849E-04	0.3668	0.2974	0.569E-01

RE(DELTA) = 10000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.7337	0.6999E-04	0.1299E-05	0.5860	0.4037	-0.439E-02
0.600	1.5587	0.5999E-04	-0.2979E-05	0.5546	0.3849	0.106E-01
0.500	1.3728	0.5000E-04	-0.6439E-05	0.5232	0.3642	0.245E-01
0.400	1.1762	0.3999E-04	-0.9119E-05	0.4862	0.3400	0.377E-01
0.300	0.9606	0.2999E-04	-0.1146E-04	0.4266	0.3123	0.509E-01
0.200	0.7039	0.1999E-04	-0.1187E-04	0.3645	0.2841	0.614E-01
0.100	0.4093	0.9999E-05	-0.6510E-05	0.3023	0.2443	0.480E-01

NA = 0.1500 XW/U = 1.4000 WT = 4.7124

PROFILE COEFFICIENTS -0.55976 -0.03039 8.02240 -11.78100 -10.57900 35.84900 -28.61700 7.71320

RE(DELTA) = 600.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.750	1.5897	0.1250E-02	0.4166E-05	0.5625	0.4717	-0.884E-03
0.650	1.4098	0.1083E-02	-0.1166E-04	0.5552	0.4610	0.275E-02
0.600	1.3197	0.9999E-03	-0.1300E-04	0.5515	0.4546	0.326E-02
0.550	1.2285	0.9166E-03	-0.9999E-05	0.5485	0.4477	0.267E-02
0.500	1.1374	0.8333E-03	-0.3499E-05	0.5458	0.4395	0.100E-02
0.450	1.0453	0.7500E-03	0.7666E-05	0.5428	0.4304	-0.238E-02
0.400	0.9532	0.6666E-03	0.2183E-04	0.5393	0.4196	-0.741E-02
0.350	0.8599	0.5833E-03	0.3999E-04	0.5330	0.4070	-0.148E-01
0.300	0.7656	0.4999E-03	0.6083E-04	0.5267	0.3918	-0.251E-01

RE(DELTA) = 1000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.750	1.6619	0.7500E-03	-0.2020E-04	0.5404	0.4512	0.656E-02
0.700	1.5690	0.6999E-03	-0.3430E-04	0.5317	0.4461	0.116E-01
0.650	1.4738	0.6500E-03	-0.4520E-04	0.5230	0.4410	0.160E-01
0.600	1.3778	0.5999E-03	-0.5209E-04	0.5176	0.4354	0.195E-01
0.550	1.2806	0.5499E-03	-0.5549E-04	0.5128	0.4294	0.222E-01
0.500	1.1828	0.5000E-03	-0.5500E-04	0.5091	0.4227	0.236E-01
0.450	1.0842	0.4499E-03	-0.5109E-04	0.5060	0.4150	0.238E-01
0.400	0.9852	0.4000E-03	-0.4359E-04	0.5032	0.4060	0.222E-01
0.350	0.8855	0.3499E-03	-0.3290E-04	0.4997	0.3952	0.185E-01
0.300	0.7851	0.2999E-03	-0.1899E-04	0.4950	0.3821	0.119E-01
0.250	0.6835	0.2500E-03	-0.2300E-05	0.4903	0.3657	0.165E-02

RE(DELTA) = 2250.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.6347	0.3111E-03	-0.2400E-05	0.5895	0.4282	0.194E-02
0.650	1.5479	0.2888E-03	-0.1324E-04	0.5661	0.4199	0.108E-01
0.600	1.4580	0.2666E-03	-0.2222E-04	0.5426	0.4115	0.186E-01
0.550	1.3635	0.2444E-03	-0.3093E-04	0.5089	0.4033	0.259E-01
0.500	1.2612	0.2222E-03	-0.3666E-04	0.4845	0.3964	0.316E-01
0.450	1.1571	0.2000E-03	-0.4053E-04	0.4716	0.3889	0.371E-01
0.400	1.0490	0.1777E-03	-0.4186E-04	0.4597	0.3813	0.412E-01

NA = 0.1500 XW/U = 1.4000 WT = 4.7124

RE(DELTA) = 2250.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.350	0.9396	0.1555E-03	-0.4048E-04	0.4519	0.3724	0.438E-01
0.300	0.8277	0.1333E-03	-0.3648E-04	0.4446	0.3624	0.441E-01
0.250	0.7147	0.1111E-03	-0.2968E-04	0.4388	0.3497	0.410E-01
0.200	0.5998	0.8888E-04	-0.2044E-04	0.4312	0.3334	0.330E-01
0.150	0.4828	0.6666E-04	-0.8844E-05	0.4164	0.3106	0.171E-01
0.100	0.3595	0.4444E-04	0.4133E-05	0.4016	0.2781	-0.103E-01

RE(DELTA) = 3440.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5493	0.1889E-03	-0.3546E-05	0.6183	0.4195	0.486E-02
0.600	1.4661	0.1744E-03	-0.8779E-05	0.5875	0.4092	0.121E-01
0.550	1.3790	0.1598E-03	-0.1450E-04	0.5567	0.3988	0.201E-01
0.500	1.2863	0.1453E-03	-0.1985E-04	0.5224	0.3887	0.277E-01
0.450	1.1874	0.1308E-03	-0.2450E-04	0.4899	0.3789	0.347E-01
0.400	1.0820	0.1162E-03	-0.2779E-04	0.4628	0.3696	0.408E-01
0.350	0.9712	0.1017E-03	-0.2933E-04	0.4426	0.3603	0.459E-01
0.300	0.8560	0.8720E-04	-0.2872E-04	0.4278	0.3504	0.493E-01
0.250	0.7374	0.7267E-04	-0.2578E-04	0.4168	0.3390	0.501E-01
0.200	0.6161	0.5813E-04	-0.2052E-04	0.4080	0.3246	0.467E-01
0.150	0.4923	0.4360E-04	-0.1233E-04	0.3967	0.3046	0.358E-01
0.100	0.3640	0.2906E-04	-0.1517E-05	0.3855	0.2747	0.128E-01

RE(DELTA) = 5640.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.5469	0.1152E-03	-0.2553E-05	0.5972	0.4201	0.555E-02
0.600	1.4622	0.1063E-03	-0.4946E-05	0.5861	0.4103	0.111E-01
0.550	1.3763	0.9751E-04	-0.7393E-05	0.5751	0.3996	0.174E-01
0.500	1.2883	0.8865E-04	-0.9645E-05	0.5597	0.3881	0.236E-01
0.450	1.1976	0.7978E-04	-0.1196E-04	0.5365	0.3757	0.302E-01
0.400	1.1018	0.7092E-04	-0.1430E-04	0.5032	0.3630	0.368E-01
0.350	0.9986	0.6205E-04	-0.1645E-04	0.4654	0.3504	0.432E-01
0.300	0.8866	0.5319E-04	-0.1780E-04	0.4313	0.3383	0.488E-01
0.250	0.7665	0.4432E-04	-0.1774E-04	0.4054	0.3261	0.529E-01
0.200	0.6399	0.3546E-04	-0.1588E-04	0.3969	0.3125	0.541E-01
0.150	0.5080	0.2659E-04	-0.1198E-04	0.3728	0.2952	0.496E-01
0.100	0.3715	0.1773E-04	-0.6081E-05	0.3986	0.2691	0.331E-01

RE(DELTA) = 7000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.6323	0.9999E-04	0.2857E-07	0.6116	0.4288	-0.749E-04
0.650	1.5491	0.9285E-04	-0.2214E-05	0.5952	0.4195	0.595E-02
0.600	1.4643	0.8571E-04	-0.4371E-05	0.5789	0.4097	0.120E-01
0.550	1.3763	0.7857E-04	-0.6129E-05	0.5656	0.3996	0.176E-01
0.500	1.2879	0.7142E-04	-0.7757E-05	0.5559	0.3883	0.234E-01
0.450	1.1964	0.6428E-04	-0.9242E-05	0.5415	0.3761	0.292E-01
0.400	1.1028	0.5714E-04	-0.1077E-04	0.5188	0.3627	0.354E-01
0.350	1.0035	0.4999E-04	-0.1232E-04	0.4843	0.3487	0.416E-01
0.300	0.8960	0.4285E-04	-0.1368E-04	0.4444	0.3348	0.479E-01
0.250	0.7780	0.3571E-04	-0.1424E-04	0.4085	0.3213	0.523E-01
0.200	0.6509	0.2857E-04	-0.1338E-04	0.3825	0.3072	0.55[illegible]E-01
0.150	0.5164	0.2142E-04	-0.1074E-04	0.3640	0.2904	0.530E-01
0.100	0.3761	0.1428E-04	-0.6142E-05	0.3455	0.2658	0.395E-01

RE(DELTA) = 10000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.6361	0.6999E-04	0.0000E 00	0.6052	0.4278	0.000E 00
0.600	1.4671	0.5999E-04	-0.3129E-05	0.5765	0.4089	0.123E-01
0.500	1.2890	0.5000E-04	-0.5599E-05	0.5479	0.3878	0.238E-01
0.400	1.1019	0.3999E-04	-0.7309E-05	0.5182	0.3630	0.363E-01
0.300	0.9027	0.2999E-04	-0.8700E-05	0.4640	0.3323	0.447E-01
0.200	0.6680	0.1999E-04	-0.9479E-05	0.3897	0.2994	0.559E-01
0.100	0.3851	0.9999E-05	-0.5519E-05	0.3155	0.2596	0.492E-01

NA = 0.1500 XW/U = 1.4000 WT = 5.4978

PROFILE COEFFICIENTS 0.11121 -3.00910 12.73400 -13.75000 -14.50900 42.76300 -33.18800 8.86480

RE(DELTA) = 1000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.4802	0.6999E-03	0.3219E-04	0.5607	0.4729	-0.121E-01
0.650	1.3908	0.6500E-03	0.2049E-04	0.5516	0.4673	-0.813E-02
0.600	1.2989	0.5999E-03	0.1179E-04	0.5425	0.4619	-0.492E-02
0.550	1.2065	0.5499E-03	0.6499E-05	0.5370	0.4558	-0.289E-02
0.500	1.1127	0.5000E-03	0.4200E-05	0.5324	0.4493	-0.200E-02
0.450	1.0187	0.4499E-03	0.5199E-05	0.5277	0.4417	-0.269E-02
0.400	0.9232	0.4000E-03	0.9000E-05	0.5227	0.4332	-0.509E-02
0.350	0.8274	0.3499E-03	0.1560E-04	0.5177	0.4230	-0.976E-02

RE(DELTA) = 1200.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.4133	0.5416E-03	0.1716E-04	0.5538	0.4599	-0.807E-02
0.600	1.3207	0.4999E-03	0.6916E-05	0.5402	0.4543	-0.339E-02
0.550	1.2282	0.4583E-03	-0.4999E-06	0.5266	0.4478	0.257E-03
0.500	1.1307	0.4166E-03	-0.3916E-05	0.5181	0.4422	0.215E-02
0.450	1.0352	0.3750E-03	-0.4916E-05	0.5143	0.4346	0.293E-02
0.400	0.9362	0.3333E-03	-0.2583E-05	0.5107	0.4272	0.169E-02
0.350	0.8394	0.2916E-03	0.1833E-05	0.5072	0.4169	-0.132E-02

RE(DELTA) = 2250.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.4623	0.2888E-03	0.2751E-04	0.6269	0.4445	-0.265E-01
0.600	1.3785	0.2666E-03	0.1640E-04	0.5850	0.4352	-0.156E-01
0.550	1.2913	0.2444E-03	0.5688E-05	0.5431	0.4259	-0.538E-02
0.500	1.1938	0.2222E-03	-0.2266E-05	0.5086	0.4188	0.217E-02
0.450	1.0947	0.2000E-03	-0.8044E-05	0.4924	0.4110	0.814E-02
0.400	0.9906	0.1777E-03	-0.1146E-04	0.4796	0.4037	0.124E-01
0.350	0.8862	0.1555E-03	-0.1222E-04	0.4696	0.3949	0.145E-01
0.300	0.7776	0.1333E-03	-0.1071E-04	0.4601	0.3858	0.142E-01
0.250	0.6689	0.1111E-03	-0.6622E-05	0.4518	0.3737	0.100E-01
0.200	0.5562	0.8888E-04	-0.6222E-06	0.4434	0.3595	0.111E-02

RE(DELTA) = 3440.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.4439	0.1889E-03	0.2601E-04	0.7493	0.4501	-0.464E-01
0.600	1.3738	0.1744E-03	0.2113E-04	0.6990	0.4367	-0.369E-01
0.550	1.3008	0.1598E-03	0.1470E-04	0.6488	0.4228	-0.252E-01
0.500	1.2192	0.1453E-03	0.7412E-05	0.5814	0.4101	-0.121E-01
0.450	1.1283	0.1308E-03	0.5523E-06	0.5250	0.3988	-0.884E-03
0.400	1.0283	0.1162E-03	-0.4999E-05	0.4845	0.3889	0.810E-02
0.350	0.9217	0.1017E-03	-0.8488E-05	0.4585	0.3797	0.145E-01
0.300	0.8101	0.8720E-04	-0.9796E-05	0.4410	0.3703	0.183E-01
0.250	0.6949	0.7267E-04	-0.8808E-05	0.4285	0.3597	0.186E-01
0.200	0.5767	0.5813E-04	-0.5784E-05	0.4181	0.3468	0.144E-01
0.150	0.4557	0.4360E-04	-0.8720E-06	0.4077	0.3291	0.268E-02

RE(DELTA) = 5640.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.4310	0.1152E-03	0.1430E-04	0.6450	0.4542	-0.363E-01
0.600	1.3538	0.1063E-03	0.1262E-04	0.6523	0.4431	-0.343E-01
0.550	1.2777	0.9751E-04	0.1102E-04	0.6596	0.4304	-0.321E-01
0.500	1.2022	0.8865E-04	0.9361E-05	0.6644	0.4159	-0.291E-01
0.450	1.1272	0.7978E-04	0.7021E-05	0.6458	0.3992	-0.226E-01
0.400	1.0472	0.7092E-04	0.3351E-05	0.5816	0.3819	-0.104E-01
0.350	0.9543	0.6205E-04	-0.8687E-06	0.5036	0.3667	0.258E-02
0.300	0.8477	0.5319E-04	-0.4326E-05	0.4472	0.3538	0.128E-01
0.250	0.7302	0.4432E-04	-0.6046E-05	0.4134	0.3423	0.193E-01
0.200	0.6056	0.3546E-04	-0.5780E-05	0.3930	0.3302	0.211E-01
0.150	0.4757	0.2659E-04	-0.3546E-05	0.3727	0.3153	0.156E-01

RE(DELTA) = 7000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.350	0.9576	0.4999E-04	0.1728E-05	0.5300	0.3654	-0.669E-02
0.300	0.8598	0.4285E-04	-0.1742E-05	0.4739	0.3489	0.672E-02
0.250	0.7453	0.3571E-04	-0.4185E-05	0.4178	0.3354	0.164E-01
0.200	0.6200	0.2857E-04	-0.4771E-05	0.3867	0.3225	0.208E-01
0.150	0.4865	0.2142E-04	-0.3585E-05	0.3669	0.3083	0.189E-01
0.100	0.3474	0.1428E-04	-0.6428E-06	0.3471	0.2878	0.449E-02

NA = 0.1500 XW/U = 2.5000 WT = 0.0000

PROFILE COEFFICIENTS 0.96014 -6.72510 20.43400 -29.83400 20.60900 -5.42650 0.00000 0.00000

RE(DELTA) = 4600.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.350	0.8026	0.7608E-04	0.2560E-04	0.5147	0.3965	-0.686E-01
0.300	0.7844	0.6521E-04	0.1547E-04	0.4657	0.3824	-0.422E-01
0.250	0.6660	0.5434E-04	0.1156E-04	0.4167	0.3753	-0.332E-01
0.200	0.5444	0.4347E-04	0.9913E-05	0.4065	0.3673	-0.340E-01
0.150	0.4200	0.3260E-04	0.9934E-05	0.3944	0.3571	-0.429E-01
0.100	0.2908	0.2173E-04	0.1082E-04	0.3823	0.3438	-0.654E-01

RE(DELTA) = 7550.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.200	0.5926	0.2649E-04	0.6754E-05	0.3733	0.3374	-0.321E-01
0.150	0.4533	0.1986E-04	0.5576E-05	0.3574	0.3309	-0.331E-01
0.100	0.3128	0.1324E-04	0.5774E-05	0.3414	0.3196	-0.475E-01
0.050	0.1599	0.6622E-05	0.5655E-05	0.3043	0.3126	-0.812E-01
0.025	0.0746	0.3311E-05	0.4079E-05	0.2966	0.3351	-0.122E 00
0.010	0.0244	0.1324E-05	0.1933E-05	0.2920	0.4098	-0.174E 00

NA = 0.1500 XW/U = 2.5000 WT = 0.0000 (TEMPORAL DATA)

PROFILE COEFFICIENTS 0.96014 -6.72510 20.43400 -29.83400 20.60900 -5.42650 0.00000 0.00000

RE(DELTA) = 1500.

ALFAR*DELTA	BETAR*NU/U**2	BETAI*NU/U**2	CIMAG	GROUP VEL.	WAVE VEL.	ALFAI*NU/U
1.6000	0.4983E-03	-0.8787E-04	-0.0823	0.4087	0.4671	0.2149E-03
1.4000	0.4427E-03	-0.5946E-04	-0.0637	0.4515	0.4744	0.1317E-03
1.2000	0.3779E-03	-0.3870E-04	-0.0483	0.4943	0.4724	0.7830E-04
1.1000	0.3446E-03	-0.3125E-04	-0.0426	0.5103	0.4700	0.6123E-04
1.0000	0.3098E-03	-0.2635E-04	-0.0395	0.5183	0.4648	0.5085E-04
0.9000	0.2755E-03	-0.2295E-04	-0.0382	0.5124	0.4593	0.4479E-04
0.7000	0.2077E-03	-0.2017E-04	-0.0432	0.5017	0.4451	0.4021E-04
0.5000	0.1417E-03	-0.2063E-04	-0.0618	0.4910	0.4253	0.4201E-04

RE(DELTA) = 3000.

ALFAR*DELTA	BETAR*NU/U**2	BETAI*NU/U**2	CIMAG	GROUP VEL.	WAVE VEL.	ALFAI*NU/U
1.6000	0.2008E-03	-0.4261E-04	-0.0799	0.2534	0.3766	0.1681E-03
1.5000	0.1921E-03	-0.3879E-04	-0.0776	0.2672	0.3843	0.1451E-03
1.4000	0.1830E-03	-0.3454E-04	-0.0740	0.2810	0.3922	0.1228E-03
1.3000	0.1734E-03	-0.2977E-04	-0.0687	0.3065	0.4001	0.9713E-04
1.0000	0.1374E-03	-0.1508E-04	-0.0452	0.4079	0.4123	0.3696E-04
0.9000	0.1233E-03	-0.1164E-04	-0.0388	0.4295	0.4110	0.2710E-04
0.8000	0.1088E-03	-0.9296E-05	-0.0348	0.4358	0.4080	0.2132E-04
0.7000	0.9426E-04	-0.7763E-05	-0.0332	0.4429	0.4039	0.1752E-04
0.6000	0.7928E-04	-0.7270E-05	-0.0363	0.4410	0.3964	0.1648E-04
0.5000	0.6485E-04	-0.7093E-05	-0.0425	0.4391	0.3891	0.1615E-04

NA = 0.1500   XW/U = 2.5000   WT = 1.5708

PROFILE COEFFICIENTS 0.47905 -0.08403 -2.48370 4.25520 -2.91840 0.76919 0.00000 0.00000

RE(DELTA) = 4600.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.550	1.5671	0.1195E-03	0.2600E-04	0.3742	0.3509	-0.285E-01
0.500	1.4342	0.1086E-03	0.1799E-04	0.3739	0.3486	-0.215E-01
0.450	1.2997	0.9782E-04	0.1223E-04	0.3737	0.3462	-0.161E-01
0.400	1.1666	0.8695E-04	0.8239E-05	0.3759	0.3428	0.122E-01
0.350	1.0337	0.7608E-04	0.6173E-05	0.3773	0.3385	-0.103E-01
0.300	0.9016	0.6521E-04	0.5608E-05	0.3782	0.3327	-0.108E-01
0.250	0.7693	0.5434E-04	0.6608E-05	0.3773	0.3249	-0.149E-01
0.200	0.6366	0.4347E-04	0.8760E-05	0.3765	0.3141	-0.238E-01

RE(DELTA) = 7550.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.450	1.4130	0.5960E-04	0.1172E-04	0.3410	0.3184	-0.213E-01
0.400	1.2656	0.5298E-04	0.6370E-05	0.3417	0.3160	-0.129E-01
0.350	1.1204	0.4635E-04	0.2860E-05	0.3424	0.3123	-0.660E-02
0.300	0.9736	0.3973E-04	0.1033E-05	0.3408	0.3081	-0.273E-02
0.250	0.8270	0.3311E-04	0.5827E-06	0.3415	0.3022	-0.181E-02
0.200	0.6808	0.2649E-04	0.1536E-05	0.3422	0.2937	-0.583E-02

NA = 0.1500   XW/U = 2.5000   WT = 1.5708   (TEMPORAL DATA)

PROFILE COEFFICIENTS 0.47905 -0.08403 -2.48370 4.25520 -2.91840 0.76919 0.00000 0.00000

RE(DELTA) = 1500.

ALFAR*DELTA	BETAR*NU/U**2	BETAI*NU/U**2	CIMAG	GROUP VEL.	WAVE VEL.	ALFAI*NU/U
1.8000	0.5102E-03	-0.5596E-04	-0.0466	0.4246	0.4252	0.1317E-03
1.6000	0.4530E-03	-0.4533E-04	-0.0425	0.4378	0.4247	0.1035E-03
1.4000	0.3935E-03	-0.3752E-04	-0.0402	0.4510	0.4216	0.8318E-04
1.2000	0.3327E-03	-0.3286E-04	-0.0410	0.4593	0.4159	0.7154E-04
1.1000	0.3019E-03	-0.3152E-04	-0.0429	0.4614	0.4118	0.6830E-04
0.9000	0.2403E-03	-0.3121E-04	-0.0520	0.4620	0.4005	0.6757E-04
0.8000	0.2095E-03	-0.3172E-04	-0.0594	0.4586	0.3929	0.6916E-04
0.7000	0.1791E-03	-0.3217E-04	-0.0689	0.4553	0.3839	0.7064E-04

RE(DELTA) = 3000.

ALFAR*DELTA	BETAR*NU/U**2	BETAI*NU/U**2	CIMAG	GROUP VEL.	WAVE VEL.	ALFAI*NU/U
1.8000	0.2229E-03	-0.2200E-04	-0.0366	0.3480	0.3715	0.6323E-04
1.6000	0.1991E-03	-0.1574E-04	-0.0295	0.3673	0.3734	0.4285E-04
1.4000	0.1739E-03	-0.1096E-04	-0.0235	0.3866	0.3727	0.2837E-04
1.3000	0.1609E-03	-0.9233E-05	-0.0213	0.3935	0.3713	0.2346E-04
1.2000	0.1476E-03	-0.7986E-05	-0.0199	0.3990	0.3692	0.2001E-04
1.1000	0.1343E-03	-0.7176E-05	-0.0195	0.4031	0.3662	0.1780E-04
1.0000	0.1208E-03	-0.6809E-05	-0.0204	0.4049	0.3624	0.1681E-04
0.9000	0.1073E-03	-0.6879E-05	-0.0229	0.4050	0.3577	0.1698E-04
0.8000	0.9381E-04	-0.7356E-05	-0.0275	0.4041	0.3518	0.1820E-04
0.7000	0.8036E-04	-0.8106E-05	-0.0347	0.4002	0.3444	0.2025E-04
0.6000	0.6713E-04	-0.8963E-05	-0.0448	0.3964	0.3356	0.2260E-04

NA = 0.1500 XW/U = 2.5000 WT = 3.1416

PROFILE COEFFICIENTS -0.97295 6.75440 -16.59400 30.04300 -52.62500 64.38000 -41.52900 10.56100

RE(DELTA) = 750.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.800	1.8059	0.1066E-02	0.4559E-04	0.5194	0.4429	-0.983E-02
0.750	1.7098	0.1000E-02	0.3319E-04	0.5181	0.4386	-0.754E-02
0.700	1.6129	0.9333E-03	0.2600E-04	0.5167	0.4340	-0.624E-02
0.650	1.5163	0.8666E-03	0.2186E-04	0.5170	0.4286	-0.559E-02
0.600	1.4195	0.7999E-03	0.2173E-04	0.5165	0.4226	-0.593E-02
0.550	1.3227	0.7333E-03	0.2479E-04	0.5159	0.4158	-0.725E-02
0.500	1.2257	0.6666E-03	0.3133E-04	0.5154	0.4079	-0.988E-02

RE(DELTA) = 900.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.6466	0.7777E-03	-0.2111E-05	0.4982	0.4251	0.574E-03
0.650	1.5464	0.7222E-03	-0.7555E-05	0.5002	0.4203	0.219E-02
0.600	1.4467	0.6666E-03	-0.9555E-05	0.5022	0.4147	0.298E-02
0.550	1.3473	0.6111E-03	-0.8888E-05	0.4992	0.4082	0.296E-02
0.500	1.2464	0.5555E-03	-0.3222E-05	0.4962	0.4011	0.115E-02

RE(DELTA) = 1000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.750	1.7674	0.7500E-03	-0.2200E-05	0.4972	0.4243	0.618E-03
0.700	1.6668	0.6999E-03	-0.1199E-04	0.4940	0.4199	0.355E-02
0.650	1.5650	0.6500E-03	-0.1849E-04	0.4909	0.4153	0.580E-02
0.600	1.4631	0.5999E-03	-0.2150E-04	0.4901	0.4100	0.720E-02
0.550	1.3610	0.5499E-03	-0.2099E-04	0.4899	0.4041	0.755E-02
0.500	1.2590	0.5000E-03	-0.1720E-04	0.4899	0.3971	0.669E-02
0.450	1.1569	0.4499E-03	-0.1030E-04	0.4894	0.3889	0.435E-02
0.400	1.0547	0.4000E-03	-0.6000E-06	0.4880	0.3792	0.277E-03
0.350	0.9520	0.3499E-03	0.1189E-04	0.4849	0.3676	-0.606E-02
0.300	0.8485	0.2999E-03	0.2680E-04	0.4789	0.3535	-0.151E-01
0.250	0.7432	0.2500E-03	0.4379E-04	0.4729	0.3363	-0.278E-01

RE(DELTA) = 3000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.8568	0.2333E-03	0.1500E-05	0.4961	0.3769	-0.120E-02
0.650	1.7541	0.2166E-03	-0.1059E-04	0.4704	0.3705	0.852E-02
0.600	1.6440	0.1999E-03	-0.2080E-04	0.4448	0.3649	0.168E-01
0.550	1.5292	0.1833E-03	-0.2853E-04	0.4296	0.3596	0.240E-01
0.500	1.4112	0.1666E-03	-0.3386E-04	0.4195	0.3543	0.302E-01
0.450	1.2908	0.1500E-03	-0.3673E-04	0.4123	0.3486	0.352E-01
0.400	1.1687	0.1333E-03	-0.3713E-04	0.4080	0.3422	0.388E-01
0.350	1.0457	0.1166E-03	-0.3513E-04	0.4055	0.3347	0.408E-01
0.300	0.9221	0.9999E-04	-0.3083E-04	0.4038	0.3253	0.405E-01
0.250	0.7981	0.8333E-04	-0.2429E-04	0.4025	0.3132	0.367E-01
0.200	0.6737	0.6666E-04	-0.1569E-04	0.4012	0.2966	0.280E-01

RE(DELTA) = 4600.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.7767	0.1413E-03	0.2086E-05	0.5417	0.3658	-0.292E-02
0.600	1.6817	0.1304E-03	-0.5717E-05	0.5005	0.3567	0.782E-02
0.550	1.5764	0.1195E-03	-0.1330E-04	0.4594	0.3488	0.178E-01
0.500	1.4638	0.1086E-03	-0.1954E-04	0.4310	0.3415	0.264E-01
0.450	1.3442	0.9782E-04	-0.2419E-04	0.4093	0.3347	0.338E-01
0.400	1.2194	0.8695E-04	-0.2695E-04	0.3948	0.3280	0.401E-01
0.350	1.0909	0.7608E-04	-0.2771E-04	0.3852	0.3208	0.450E-01
0.300	0.9598	0.6521E-04	-0.2645E-04	0.3793	0.3125	0.481E-01
0.250	0.8273	0.5434E-04	-0.2315E-04	0.3760	0.3021	0.484E-01
0.200	0.6939	0.4347E-04	-0.1784E-04	0.3727	0.2882	0.441E-01

RE(DELTA) = 7550.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.8590	0.9271E-04	0.6503E-05	0.5914	0.3765	-0.156E-01
0.600	1.6793	0.7947E-04	-0.6754E-06	0.5378	0.3572	0.163E-02
0.500	1.4867	0.6622E-04	-0.7947E-05	0.4842	0.3363	0.195E-01
0.400	1.2641	0.5298E-04	-0.1479E-04	0.4180	0.3164	0.369E-01
0.300	1.0056	0.3973E-04	-0.1799E-04	0.3702	0.2983	0.500E-01
0.200	0.7229	0.2649E-04	-0.1505E-04	0.3475	0.2766	0.546E-01
0.100	0.4299	0.1324E-04	-0.5324E-05	0.3247	0.2326	0.303E-01

NA = 0.1500 XW/U = 2.5000 WT = 3.1416 (TEMPORAL DATA)

PROFILE COEFFICIENTS -0.97295 6.75440 -16.59400 30.04300 -52.62500 64.38000 -41.52900 10.56100

RE(DELTA) = 1500.

ALFAR*DELTA	BETAR*NU/U**2	BETAI*NU/U**2	CIMAG	GROUP VEL.	WAVE VEL.	ALFAI*NU/U
1.9000	0.5151E-03	0.1306E-05	0.0010	0.4541	0.4067	-0.2877E-05
1.8000	0.4847E-03	0.7666E-05	0.0063	0.4587	0.4039	-0.1671E-04
1.7000	0.4540E-03	0.1268E-04	0.0111	0.4633	0.4006	-0.2737E-04
1.6000	0.4229E-03	0.1635E-04	0.0153	0.4669	0.3965	-0.3502E-04
1.5000	0.3917E-03	0.1867E-04	0.0186	0.4685	0.3917	-0.3987E-04
1.4000	0.3605E-03	0.1971E-04	0.0211	0.4681	0.3862	-0.4211E-04
1.3000	0.3293E-03	0.1960E-04	0.0226	0.4663	0.3800	-0.4204E-04
1.2000	0.2983E-03	0.1828E-04	0.0228	0.4630	0.3729	-0.3948E-04
1.1000	0.2675E-03	0.1576E-04	0.0214	0.4577	0.3648	-0.3442E-04
1.0000	0.2373E-03	0.1243E-04	0.0186	0.4529	0.3559	-0.2746E-04
0.9000	0.2071E-03	0.8026E-05	0.0133	0.4468	0.3453	-0.1796E-04
0.8000	0.1777E-03	0.3026E-05	0.0056	0.4369	0.3332	-0.6926E-05
0.7000	0.1489E-03	-0.2433E-05	-0.0052	0.4271	0.3191	0.5696E-05

RE(DELTA) = 3000.

ALFAR*DELTA	BETAR*NU/U**2	BETAI*NU/U**2	CIMAG	GROUP VEL.	WAVE VEL.	ALFAI*NU/U
1.9000	0.2391E-03	-0.3093E-05	-0.0048	0.4296	0.3776	0.7200E-05
1.8000	0.2247E-03	0.2373E-05	0.0039	0.4324	0.3746	-0.5487E-05
1.6000	0.1957E-03	0.1033E-04	0.0193	0.4382	0.3669	-0.2358E-04
1.5000	0.1810E-03	0.1286E-04	0.0257	0.4391	0.3621	-0.2929E-04
1.4000	0.1664E-03	0.1456E-04	0.0312	0.4377	0.3566	-0.3326E-04
1.3000	0.1518E-03	0.1549E-04	0.0357	0.4351	0.3505	-0.3559E-04
1.2000	0.1374E-03	0.1565E-04	0.0391	0.4316	0.3435	-0.3627E-04
1.1000	0.1231E-03	0.1506E-04	0.0410	0.4258	0.3357	-0.3537E-04
1.0000	0.1090E-03	0.1383E-04	0.0415	0.4183	0.3271	-0.3306E-04
0.9000	0.9522E-04	0.1200E-04	0.0400	0.4096	0.3174	-0.2930E-04
0.8000	0.8173E-04	0.9623E-05	0.0360	0.3990	0.3065	-0.2411E-04
0.7000	0.6862E-04	0.6799E-05	0.0291	0.3869	0.2940	-0.1757E-04
0.6000	0.5593E-04	0.3676E-05	0.0183	0.3734	0.2797	-0.9845E-05
0.5000	0.4372E-04	0.4366E-06	0.0026	0.3559	0.2623	-0.1226E-05
0.4000	0.3221E-04	-0.2546E-05	-0.0190	0.3384	0.2415	0.7524E-05

NA = 0.1500 XW/U = 2.5000 WT = 3.9270

PROFILE COEFFICIENTS -1.24170 5.34190 -5.50590 4.79850 -25.85900 51.44600 -40.07300 11.11000

RE(DELTA) = 500.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.850	1.8610	0.1699E-02	0.4459E-04	0.5414	0.4567	-0.648E-02
0.800	1.7690	0.1600E-02	0.3080E-04	0.5414	0.4522	-0.471E-02
0.750	1.6763	0.1500E-02	0.2220E-04	0.5414	0.4474	-0.358E-02
0.700	1.5843	0.1399E-02	0.1899E-04	0.5431	0.4418	-0.325E-02
0.650	1.4922	0.1300E-02	0.1980E-04	0.5423	0.4355	-0.359E-02
0.600	1.3999	0.1199E-02	0.2460E-04	0.5428	0.4286	-0.477E-02
0.550	1.3080	0.1099E-02	0.3339E-04	0.5402	0.4204	-0.689E-02
0.500	1.2148	0.1000E-02	0.4080E-04	0.5373	0.4115	-0.107E-01
0.450	1.1219	0.8999E-03	0.6659E-04	0.5359	0.4011	-0.159E-01
0.400	1.0282	0.8000E-03	0.8880E-04	0.5344	0.3890	-0.230E-01

RE(DELTA) = 600.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.800	1.8024	0.1333E-02	-0.1966E-04	0.5290	0.4438	0.346E-02
0.750	1.7075	0.1250E-02	-0.2999E-04	0.5265	0.4392	0.555E-02
0.700	1.6125	0.1166E-02	-0.3533E-04	0.5241	0.4341	0.689E-02
0.650	1.5167	0.1083E-02	-0.3633E-04	0.5230	0.4285	0.751E-02
0.600	1.4213	0.9999E-03	-0.3300E-04	0.5243	0.4221	0.730E-02
0.550	1.3260	0.9166E-03	-0.2516E-04	0.5235	0.4147	0.596E-02
0.500	1.2303	0.8333E-03	-0.1266E-04	0.5227	0.4064	0.322E-02

RE(DELTA) = 1000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
1.000	2.2866	0.1000E-02	0.4300E-04	0.5385	0.4373	-0.101E-01
0.950	2.1928	0.9500E-03	0.1220E-04	0.5258	0.4332	-0.292E-02
0.900	2.0964	0.8999E-03	-0.1470E-04	0.5131	0.4293	0.359E-02
0.850	1.9979	0.8499E-03	-0.3709E-04	0.5038	0.4254	0.935E-02
0.800	1.8979	0.8000E-03	-0.5640E-04	0.4963	0.4215	0.147E-01
0.750	1.7964	0.7500E-03	-0.7110E-04	0.4909	0.4175	0.194E-01
0.700	1.6942	0.6999E-03	-0.8170E-04	0.4866	0.4131	0.234E-01
0.650	1.5909	0.6500E-03	-0.8850E-04	0.4833	0.4085	0.268E-01
0.600	1.4873	0.5999E-03	-0.9119E-04	0.4819	0.4034	0.295E-01
0.550	1.3834	0.5499E-03	-0.9010E-04	0.4811	0.3975	0.313E-01

NA = 0.1500 XW/U = 2.5000 WT = 3.9270

RE(DELTA) = 1000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.400	1.0714	0.4000E-03	-0.6429E-04	0.4807	0.3733	0.288E-01
0.350	0.9674	0.3499E-03	-0.4889E-04	0.4798	0.3617	0.242E-01
0.300	0.8630	0.2999E-03	-0.3030E-04	0.4768	0.3476	0.167E-01
0.250	0.7577	0.2500E-03	-0.9100E-05	0.4697	0.3299	0.564E-02
0.200	0.6501	0.2000E-03	0.1470E-04	0.4626	0.3076	-0.104E-01

RE(DELTA) = 4600.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.850	2.0895	0.1847E-03	0.2000E-05	0.5848	0.4067	-0.257E-02
0.800	2.0030	0.1739E-03	-0.3695E-05	0.5715	0.3994	0.485E-02
0.750	1.9145	0.1630E-03	-0.9065E-05	0.5581	0.3917	0.121E-01
0.700	1.8238	0.1521E-03	-0.1417E-04	0.5441	0.3838	0.194E-01
0.650	1.7307	0.1413E-03	-0.1908E-04	0.5292	0.3755	0.268E-01
0.600	1.6348	0.1304E-03	-0.2356E-04	0.5089	0.3670	0.337E-01
0.550	1.5341	0.1195E-03	-0.2815E-04	0.4852	0.3585	0.409E-01
0.500	1.4286	0.1086E-03	-0.3208E-04	0.4617	0.3499	0.477E-01
0.450	1.3174	0.9782E-04	-0.3528E-04	0.4383	0.3415	0.539E-01
0.400	1.2003	0.8695E-04	-0.3728E-04	0.4175	0.3332	0.596E-01
0.350	1.0778	0.7608E-04	-0.3778E-04	0.4010	0.3247	0.646E-01
0.300	0.9509	0.6521E-04	-0.3643E-04	0.3891	0.3154	0.689E-01
0.250	0.8208	0.5434E-04	-0.3304E-04	0.3804	0.3045	0.704E-01
0.200	0.6880	0.4347E-04	-0.2747E-04	0.3760	0.2906	0.690E-01
0.150	0.5549	0.3260E-04	-0.1969E-04	0.3715	0.2703	0.606E-01
0.100	0.4188	0.2173E-04	-0.9913E-05	0.3527	0.2387	0.384E-01
0.050	0.2709	0.1086E-04	0.1065E-05	0.3339	0.1845	-0.604E-02

RE(DELTA) = 7550.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.8314	0.9271E-04	-0.9165E-05	0.5375	0.3822	0.203E-01
0.600	1.6396	0.7947E-04	-0.1451E-04	0.5083	0.3659	0.339E-01
0.500	1.4377	0.6622E-04	-0.1871E-04	0.4791	0.3477	0.470E-01
0.400	1.2217	0.5298E-04	-0.2189E-04	0.4393	0.3274	0.594E-01
0.300	0.9812	0.3973E-04	-0.2321E-04	0.3934	0.3057	0.703E-01
0.200	0.7118	0.2649E-04	-0.2005E-04	0.3589	0.2809	0.763E-01
0.100	0.4234	0.1324E-04	-0.9801E-05	0.3244	0.2361	0.567E-01

NA = 0.1500 XW/U = 2.5000 WT = 3.9270 (TEMPORAL DATA)

PROFILE COEFFICIENTS -1.24170 5.34190 -5.50590 4.79850 -25.85900 51.44600 -40.07300 11.11000

RE(DELTA) = 1500.

ALFAR*DELTA	BETAR*NU/U**2	BETAI*NU/U**2	CIMAG	GROUP VEL.	WAVE VEL.	ALFAI*NU/U
2.1000	0.5814E-03	0.3759E-05	0.0026	0.4804	0.4153	-0.7826E-05
1.9000	0.5173E-03	0.2216E-04	0.0175	0.4820	0.4084	-0.4598E-04
1.7000	0.4529E-03	0.3385E-04	0.0298	0.4836	0.3996	-0.6999E-04
1.5000	0.3884E-03	0.3951E-04	0.0395	0.4814	0.3884	-0.8208E-04
1.3000	0.3245E-03	0.3953E-04	0.0456	0.4751	0.3744	-0.8320E-04
1.2000	0.2929E-03	0.3752E-04	0.0469	0.4698	0.3662	-0.7986E-04
1.1000	0.2618E-03	0.3431E-04	0.0467	0.4626	0.3571	-0.7416E-04
1.0000	0.2313E-03	0.3006E-04	0.0450	0.4541	0.3469	-0.6618E-04
0.8000	0.1719E-03	0.1837E-04	0.0344	0.4328	0.3224	-0.4244E-04
0.6000	0.1158E-03	0.4166E-05	0.0104	0.4053	0.2896	-0.1027E-04
0.5000	0.8936E-04	-0.2726E-05	-0.0081	0.3915	0.2681	0.6963E-05

RE(DELTA) = 3000.

ALFAR*DELTA	BETAR*NU/U**2	BETAI*NU/U**2	CIMAG	GROUP VEL.	WAVE VEL.	ALFAI*NU/U
2.1000	0.2849E-03	-0.3090E-05	-0.0044	0.5329	0.4071	0.5797E-05
2.0000	0.2673E-03	0.2683E-05	0.0040	0.5208	0.4010	-0.5151E-05
1.9000	0.2502E-03	0.8136E-05	0.0128	0.5008	0.3951	-0.1597E-04
1.7000	0.2170E-03	0.1651E-04	0.0291	0.4950	0.3830	-0.3336E-04
1.5000	0.1842E-03	0.2206E-04	0.0441	0.4810	0.3684	-0.4586E-04
1.3000	0.1529E-03	0.2411E-04	0.0556	0.4613	0.3528	-0.5226E-04
1.1000	0.1227E-03	0.2310E-04	0.0630	0.4396	0.3347	-0.5253E-04
1.0000	0.1082E-03	0.2160E-04	0.0648	0.4317	0.3248	-0.5005E-04
0.9000	0.9394E-04	0.1923E-04	0.0641	0.4215	0.3131	-0.4561E-04
0.8000	0.8018E-04	0.1638E-04	0.0614	0.4053	0.3006	-0.4041E-04
0.7000	0.6691E-04	0.1301E-04	0.0557	0.3894	0.2867	-0.3341E-04
0.6000	0.5421E-04	0.9249E-05	0.0462	0.3726	0.2710	-0.2482E-04
0.5000	0.4207E-04	0.5249E-05	0.0314	0.3534	0.2524	-0.1485E-04
0.4000	0.3066E-04	0.1396E-05	0.0104	0.3299	0.2299	-0.4232E-05
0.3000	0.2007E-04	-0.1813E-05	-0.0181	0.3064	0.2008	0.5916E-05

NA = 0.1500 XW/U = 2.5000 WT = 4.7124

PROFILE COEFFICIENTS -0.00349 -0.00728 12.83800 -28.71700 12.97800 21.30800 -25.67400 7.99420

RE(DELTA) = 500.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.750	1.6101	0.1500E-02	0.6000E-06	0.5580	0.4658	-0.103E-03
0.700	1.5202	0.1399E-02	-0.4200E-05	0.5549	0.4604	0.766E-03
0.650	1.4299	0.1300E-02	-0.4200E-05	0.5518	0.4545	0.810E-03
0.600	1.3390	0.1199E-02	0.0000E 00	0.5488	0.4480	0.000E 00

RE(DELTA) = 600.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.850	1.8191	0.1416E-02	-0.1233E-04	0.5497	0.4672	0.223E-02
0.800	1.7280	0.1333E-02	-0.2766E 04	0.5464	0.4629	0.524E-02
0.750	1.6361	0.1250E-02	-0.3883E-04	0.5431	0.4584	0.773E-02
0.700	1.5439	0.1166E-02	-0.4533E-04	0.5414	0.4533	0.953E-02
0.650	1.4514	0.1083E-02	-0.4749E-04	0.5399	0.4478	0.106E-01
0.600	1.3587	0.9999E-03	-0.4533E-04	0.5387	0.4415	0.107E-01
0.550	1.2653	0.9166E-03	-0.3899E-04	0.5373	0.4345	0.993E-02
0.500	1.1726	0.8333E-03	-0.2866E-04	0.5349	0.4264	0.784E-02
0.400	0.9846	0.6666E-03	0.3833E-05	0.5301	0.4062	-0.123E-02

RE(DELTA) = 4600.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.800	1.8631	0.1739E-03	-0.5086E-05	0.5994	0.4293	0.752E-02
0.750	1.7790	0.1630E-03	-0.8782E-05	0.5856	0.4215	0.132E-01
0.700	1.6923	0.1521E-03	-0.1250E-04	0.5717	0.4136	0.194E-01
0.650	1.6041	0.1413E-03	-0.1586E-04	0.5609	0.4052	0.255E-01
0.600	1.5140	0.1304E-03	-0.1904E-04	0.5477	0.3963	0.316E-01
0.550	1.4215	0.1195E-03	-0.2200E-04	0.5309	0.3869	0.378E-01
0.500	1.3256	0.1086E-03	-0.2480E-04	0.5099	0.3771	0.438E-01
0.450	1.2253	0.9782E-04	-0.2728E-04	0.4855	0.3672	0.497E-01
0.400	1.1195	0.8695E-04	-0.2917E-04	0.4599	0.3573	0.551E-01
0.350	1.0077	0.7608E-04	-0.3006E-04	0.4365	0.3473	0.599E-01
0.300	0.8903	0.6521E-04	-0.2954E-04	0.4173	0.3369	0.637E-01
0.250	0.7680	0.5434E-04	-0.2728E-04	0.4026	0.3255	0.658E-01
0.200	0.6419	0.4347E-04	-0.2304E-04	0.3917	0.3115	0.646E-01
0.150	0.5127	0.3260E-04	-0.1669E-04	0.3813	0.2925	0.571E-01
0.100	0.3796	0.2173E-04	-0.8369E-05	0.3596	0.2634	0.364E-01
0.050	0.2341	0.1086E-04	0.1152E-05	0.3379	0.2135	-0.765E-02

RE(DELTA) = 7550.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.800	1.8715	0.1059E-03	-0.3417E-05	0.5885	0.4274	0.811E-02
0.700	1.6982	0.9271E-04	-0.8198E-05	0.5646	0.4122	0.205E-01
0.600	1.5171	0.7947E-04	-0.1202E-04	0.5406	0.3954	0.323E-01
0.500	1.3281	0.6622E-04	-0.1483E-04	0.5164	0.3764	0.435E-01
0.400	1.1296	0.5298E-04	-0.1680E-04	0.4819	0.3541	0.541E-01
0.300	0.9123	0.3973E-04	-0.1792E-04	0.4311	0.3288	0.639E-01
0.200	0.6636	0.2649E-04	-0.1607E-04	0.3816	0.3013	0.698E-01
0.100	0.3868	0.1324E-04	-0.8039E-05	0.3322	0.2585	0.521E-01

NA = 0.1500 XW/U = 2.5000 WT = 4.7124 (TEMPORAL DATA)

PROFILE COEFFICIENTS -0.70349 -0.00728 12.83800 -28.71700 12.97800 21.30800 -25.67400 7.99420

RE(DELTA) = 1500.

ALFAR*DELTA	BETAR*NU/U**2	BETAI*NU/U**2	CIMAG	GROUP VEL.	WAVE VEL.	ALFAI*NU/U
2.0000	0.5899E-03	-0.2066E-05	-0.0015	0.5327	0.4424	0.3879E-05
1.9000	0.5546E-03	0.8560E-05	0.0067	0.5282	0.4378	-0.1620E-04
1.8000	0.5195E-03	0.1735E-04	0.0144	0.5237	0.4329	-0.3313E-04
1.7000	0.4847E-03	0.2443E-04	0.0215	0.5200	0.4277	-0.4699E-04
1.6000	0.4502E-03	0.2982E-04	0.0279	0.5164	0.4220	-0.5775E-04
1.5000	0.4159E-03	0.3365E-04	0.0336	0.5123	0.4159	-0.6567E-04
1.4000	0.3818E-03	0.3591E-04	0.0384	0.5073	0.4091	-0.7076E-04
1.3000	0.3482E-03	0.3673E-04	0.0423	0.5018	0.4018	-0.7320E-04
1.2000	0.3149E-03	0.3608E-04	0.0451	0.4955	0.3937	-0.7282E-04
1.1000	0.2821E-03	0.3409E-04	0.0465	0.4870	0.3848	-0.7001E-04
1.0000	0.2500E-03	0.3091E-04	0.0463	0.4773	0.3750	-0.6476E-04
0.8000	0.1876E-03	0.2101E-04	0.0394	0.4549	0.3518	-0.4618E-04
0.6000	0.1287E-03	0.7979E-05	0.0199	0.4236	0.3218	-0.1874E-04
0.5000	0.1008E-03	0.1073E-05	0.0032	0.4068	0.3026	-0.2638E-05
0.4000	0.7449E-04	-0.5186E-05	-0.0194	0.3879	0.2793	0.1337E-04

RE(DELTA) = 3000.

ALFAR*DELTA	BETAR*NU/U**2	BETAI*NU/U**2	CIMAG	GROUP VEL.	WAVE VEL.	ALFAI*NU/U
2.0000	0.2941E-03	-0.3356E-05	-0.0050	0.5843	0.4412	0.5743E-05
1.9000	0.2748E-03	0.1566E-05	0.0024	0.5754	0.4339	-0.2722E-05
1.8000	0.2557E-03	0.5990E-05	0.0099	0.5666	0.4263	-0.1057E-04
1.6000	0.2187E-03	0.1374E-04	0.0257	0.5421	0.4101	-0.2535E-04
1.4000	0.1835E-03	0.1887E-04	0.0404	0.5159	0.3932	-0.3658E-04
1.2000	0.1499E-03	0.2095E-04	0.0523	0.4903	0.3748	-0.4273E-04
1.1000	0.1338E-03	0.2083E-04	0.0568	0.4766	0.3649	-0.4370E-04
1.0000	0.1181E-03	0.1999E-04	0.0599	0.4628	0.3544	-0.4320E-04
0.9000	0.1029E-03	0.1841E-04	0.0613	0.4477	0.3431	-0.4111E-04
0.8000	0.8830E-04	0.1619E-04	0.0607	0.4316	0.3311	-0.3791E-04
0.6000	0.6056E-04	0.1006E-04	0.0503	0.3962	0.3028	-0.2541E-04
0.4000	0.3547E-04	0.2719E-05	0.0204	0.3534	0.2460	-0.7695E-05
0.3000	0.2407E-04	-0.6133E-06	-0.0061	0.3320	0.2406	0.1846E-05

NA = 0.1500   XW/U = 2.5000   WT = 5.4978

PROFILE COEFFICIENTS 0.28612 -5.34800 24.26700 -44.20100 33.89000 -3.72330 -8.47280 3.31910

RE(DELTA) = 900.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.600	1.2731	0.6666E-03	0.0000E 00	0.5530	0.4712	0.000E 00
0.550	1.1813	0.6111E-03	-0.3333E-05	0.5501	0.4655	0.139E-02
0.500	1.0913	0.5555E-03	-0.2666E-05	0.5471	0.4581	0.120E-02
0.450	0.9985	0.5000E-03	0.3333E-06	0.5442	0.4506	-0.163E-03

RE(DELTA) = 1000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.3741	0.6500E-03	0.2400E-05	0.5585	0.4730	-0.975E-03
0.600	1.2842	0.5999E-03	-0.4300E-05	0.5513	0.4672	0.184E-02
0.550	1.1927	0.5499E-03	-0.8299E-05	0.5440	0.4611	0.378E-02
0.500	1.1004	0.5000E-03	-0.9200E-05	0.5388	0.4543	0.450E-02
0.450	1.0071	0.4499E-03	-0.7300E-05	0.5336	0.4468	0.386E-02
0.400	0.9130	0.4000E-03	-0.2400E-05	0.5284	0.4381	0.138E-02

RE(DELTA) = 1500.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.4146	0.4333E-03	0.3999E-05	0.5676	0.4594	-0.240E-02
0.600	1.3245	0.3999E-03	-0.4933E-05	0.5500	0.4530	0.307E-02
0.550	1.2328	0.3666E-03	-0.1226E-04	0.5325	0.4461	0.794E-02
0.500	1.1366	0.3333E-03	-0.1659E-04	0.5192	0.4399	0.113E-01
0.450	1.0[illegible]02	0.3000E-03	-0.1846E-04	0.5118	0.4326	0.136E-01
0.400	0.9412	0.2666E-03	-0.1766E-04	0.5047	0.4249	0.142E-01
0.350	0.8421	0.2333E-03	-0.1439E-04	0.4983	0.4156	0.127E-01
0.300	0.7405	0.1999E-03	-0.8666E-05	0.4909	0.4051	0.861E-02
0.250	0.6384	0.1666E-03	-0.7999E-06	0.4816	0.3916	0.905E-03
0.200	0.5328	0.1333E-03	0.9000E-05	0.4722	0.3753	-0.119E-01

RE(DELTA) = 3000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.4288	0.216[illegible]E-03	0.1573E-04	0.6871	0.4549	-0.226E-01
0.600	1.3530	0.1999E-03	0.9933E-05	0.6446	0.4434	-0.141E-01
0.550	1.2736	0.1833E-03	0.3833E-05	0.6022	0.4318	-0.543E-02
0.500	1.1866	0.1666E-03	-0.2433E-05	0.5564	0.4213	0.342E-02
0.450	1.0937	0.1500E-03	-0.7599E-05	0.5211	0.4114	0.108E-01
0.400	0.9945	0.1333E-03	-0.1153E-04	0.4926	0.4022	0.171E-01
0.350	0.8906	0.1166E-03	-0.1336E-04	0.4723	0.3929	0.212E-01
0.300	0.7827	0.9999E-04	-0.1339E-04	0.4569	0.3832	0.234E-01
0.250	0.6717	0.8333E-04	-0.111[illegible]E-04	0.4447	0.3721	0.221E-01
0.200	0.5578	0.6666E-04	-0.7100E-05	0.4314	0.3585	0.164E-01
0.100	0.3177	0.3333E-04	0.5833E-05	0.4050	0.3147	-0.223E-01

RE(DELTA) = 4600.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.650	1.4160	0.1413E-03	0.1006E-04	0.6565	0.4590	-0.214E-01
0.600	1.3392	0.1304E-03	0.8130E-05	0.6523	0.4480	-0.182E-01
0.550	1.2627	0.1195E-03	0.6000E-05	0.6481	0.4355	-0.141E-01
0.500	1.1949	0.1086E-03	0.3499E-05	0.6288	0.4219	-0.854E-02
0.450	1.1036	0.9782E-04	0.3260E-06	0.5896	0.4077	-0.801E-03
0.400	1.0150	0.8695E-04	-0.3260E-05	0.5377	0.3940	0.794E-02
0.350	0.9172	0.7608E-04	-0.6456E-05	0.4903	0.3815	0.158E-01
0.300	0.8107	0.6521E-04	-0.8500E-05	0.4548	0.3700	0.219E-01
0.250	0.6971	0.5434E-04	-0.8869E-05	0.4303	0.3586	0.251E-01
0.200	0.5782	0.4347E-04	-0.7369E-05	0.4126	0.3459	0.241E-01
0.150	0.4547	0.3260E-04	-0.4043E-05	0.3962	0.3298	0.162E-01
0.100	0.3257	0.2173E-04	0.6521E-06	0.3797	0.3070	-0.349E-02

RE(DELTA) = 7550.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.500	1.1734	0.6622E-04	0.2185E-05	0.6670	0.4261	-0.937E-02
0.400	1.0080	0.5298E-04	0.7152E-06	0.5855	0.3968	-0.313E-02
0.300	0.8315	0.3973E-04	-0.2437E-05	0.5041	0.3607	0.111E-01
0.200	0.6051	0.2649E-04	-0.4900E-05	0.4084	0.3305	0.249E-01
0.100	0.3386	0.1324E-04	-0.1364E-05	0.3127	0.2953	0.951E-02

NA = 0.1500 XW/U = 5.0600 WT = 3.9270

PROFILE COEFFICIENTS -1.99960 10.82100 -15.44200 -12.58300 62.60900 -77.04901 43.08600 -9.42560

RE(DELTA) = 500.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.6973	0.1399E-02	0.9439E-04	0.4917	0.4124	-0.136E-01
0.600	1.4934	0.1199E-02	0.9180E-04	0.4924	0.4017	-0.151E-01
0.500	1.2912	0.1000E-02	0.1101E-03	0.4932	0.3872	-0.210E-01
0.400	1.0879	0.8000E-03	0.1479E-03	0.4876	0.3676	-0.331E-01
0.300	0.8810	0.5999E-03	0.2040E-03	0.4695	0.3405	-0.543E-01
0.200	0.6616	0.4000E-03	0.2821E-03	0.4515	0.3022	-0.962E-01

RE(DELTA) = 600.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.700	1.7372	0.1166E-02	0.1183E-04	0.4724	0.4029	-0.193E-02
0.600	1.5255	0.9999E-03	0.7666E-05	0.4745	0.3933	-0.143E-02
0.500	1.3157	0.8333E-03	0.2316E-04	0.4765	0.3800	-0.503E-02
0.400	1.1058	0.6666E-03	0.5749E-04	0.4785	0.3617	-0.149E-01

RE(DELTA) = 700.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.800	1.9923	0.1142E-02	-0.5857E-05	0.4522	0.4015	0.930E-03
0.700	1.7722	0.9999E-03	-0.3399E-04	0.4555	0.3949	0.611E-02
0.600	1.5533	0.8571E-03	-0.4085E-04	0.4589	0.3862	0.845E-02
0.500	1.3364	0.7142E-03	-0.2785E-04	0.4620	0.3741	0.674E-02
0.400	1.1204	0.5714E-03	0.3285E-05	0.4626	0.3570	-0.949E-03
0.300	0.9041	0.4285E-03	0.5071E-04	0.4632	0.3318	-0.181E-01

RE(DELTA) = 1000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.900	2.3237	0.8999E-03	0.4400E-05	0.4289	0.3873	-0.812E-03
0.800	2.0905	0.8000E-03	-0.4929E-04	0.4267	0.3826	0.100E-01
0.700	1.8550	0.6999E-03	-0.8220E-04	0.4245	0.3773	0.188E-01
0.600	1.6194	0.5999E-03	-0.9539E-04	0.4260	0.3705	0.251E-01
0.500	1.3856	0.5000E-03	-0.9010E-04	0.4299	0.3608	0.279E-01
0.400	1.1542	0.4000E-03	-0.6770E-04	0.4340	0.3465	0.254E-01
0.300	0.9248	0.2999E-03	-0.2990E-04	0.4333	0.3243	0.140E-01
0.200	0.6927	0.2000E-03	0.2139E-04	0.4118	0.2887	-0.127E-01
0.100	0.4381	0.1000E-03	0.8880E-04	0.3902	0.2282	-0.790E-01

RE(DELTA) = 1500.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.900	2.4311	0.6000E-03	0.1159E-04	0.4290	0.3702	-0.307E-02
0.800	2.1948	0.5333E-03	-0.4266E-04	0.4159	0.3644	0.121E-01
0.700	1.9501	0.4666E-03	-0.7973E-04	0.4028	0.3589	0.247E-01
0.600	1.6982	0.3999E-03	-0.9973E-04	0.3965	0.3533	0.349E-01
0.500	1.4458	0.3333E-03	-0.1034E-03	0.3978	0.3458	0.426E-01
0.400	1.1955	0.2666E-03	-0.9139E-04	0.4021	0.3345	0.461E-01
0.300	0.9485	0.1999E-03	-0.6500E-04	0.4060	0.3162	0.417E-01
0.200	0.7029	0.1333E-03	-0.2580E-04	0.3965	0.2845	0.218E-01
0.100	0.4438	0.6666E-04	0.2479E-04	0.3871	0.2253	-0.324E-01

RE(DELTA) = 2850.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.850	2.3926	0.2982E-03	0.8280E-05	0.4816	0.3552	-0.475E-02
0.800	2.2863	0.2807E-03	-0.8771E-05	0.4593	0.3499	0.502E-02
0.750	2.1748	0.2631E-03	-0.2470E-04	0.4371	0.3448	0.141E-01
0.700	2.0574	0.2456E-03	-0.3912E-04	0.4168	0.3402	0.225E-01
0.650	1.9348	0.2280E-03	-0.5157E-04	0.4003	0.3359	0.304E-01
0.600	1.8075	0.2105E-03	-0.6178E-04	0.3869	0.3319	0.376E-01
0.550	1.6763	0.1929E-03	-0.6940E-04	0.3769	0.3281	0.444E-01
0.500	1.5422	0.1754E-03	-0.7431E-04	0.3699	0.3242	0.508E-01
0.450	1.4060	0.1578E-03	-0.7635E-04	0.3656	0.3200	0.565E-01
0.400	1.2687	0.1403E-03	-0.7543E-04	0.3633	0.3152	0.615E-01
0.350	1.1308	0.1228E-03	-0.7154E-04	0.3629	0.3095	0.654E-01
0.300	0.9932	0.1052E-03	-0.6480E-04	0.3640	0.3020	0.676E-01
0.250	0.8561	0.8771E-04	-0.5515E-04	0.3657	0.2920	0.671E-01
0.200	0.7198	0.7017E-04	-0.4273E-04	0.3671	0.2778	0.621E-01
0.150	0.5837	0.5263E-04	-0.2768E-04	0.3636	0.2569	0.491E-01
0.100	0.4448	0.3508E-04	-0.1042E-04	0.3602	0.2248	0.240E-01

NA = 0.1500   XW/U = 5.0600   WT = 3.9270

RE(DELTA) = 4000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.800	2.2967	0.2000E-03	-0.4149E-05	0.4736	0.3483	0.342E-02
0.700	2.0778	0.1749E-03	-0.2469E-04	0.4388	0.3368	0.208E-01
0.600	1.8402	0.1499E-03	-0.4212E-04	0.4040	0.3260	0.369E-01
0.500	1.5819	0.1250E-03	-0.5437E-04	0.3749	0.3160	0.515E-01
0.400	1.3062	0.1000E-03	-0.5899E-04	0.3562	0.3062	0.643E-01
0.300	1.0203	0.7499E-04	-0.5437E-04	0.3483	0.2940	0.742E-01
0.200	0.7321	0.5000E-04	-0.3964E-04	0.3458	0.2731	0.751E-01
0.100	0.4437	0.2500E-04	-0.1505E-04	0.3453	0.2253	0.468E-01

RE(DELTA) = 5000.

BETAR*DELTA/U	ALFAR*DELTA	BETAR*NU/U**2	ALFAI*NU/U	GROUP VEL.	WAVE VEL.	CITMP
0.800	2.3035	0.1599E-03	-0.3840E-05	0.4720	0.3472	0.393E-02
0.700	2.0844	0.1399E-03	-0.1960E-04	0.4424	0.3358	0.208E-01
0.600	1.8510	0.1199E-03	-0.3300E-04	0.4127	0.3241	0.367E-01
0.500	1.5992	0.1000E-03	-0.4321E-04	0.3822	0.3126	0.516E-01
0.400	1.3270	0.7999E-04	-0.4849E-04	0.3568	0.3014	0.652E-01
0.300	1.0382	0.5999E-04	-0.4659E-04	0.3417	0.2889	0.766E-01
0.200	0.7416	0.3999E-04	-0.3588E-04	0.3362	0.2696	0.813E-01
0.100	0.4434	0.1999E-04	-0.1584E-04	0.3307	0.2255	0.590E-01

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North Atlantic Treaty Organization, Advisory Group for Aerospace Research and Development
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H.J.Obremski, M.V.Morkovin and M.Landahl
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A PORTFOLIO OF STABILITY CHARACTERISTICS OF INCOMPRESSIBLE BOUNDARY LAYERS
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Much improvement of the theoretical and experimental knowledge concerning free-stream disturbances and the specific manner in which they bring about the growth of Tollmien-Schlichting waves will be needed before further progress can be made. Analysis of the numerical variations of stability characteristics with various features of the related profiles clarifies the role of $U''(y)$ and of the location of the inflection point. The usual shape factor H emerges as the only simple parameter capable of correlating satisfactorily the minimum critical Reynolds number for non-similar profiles.

Throughout, emphasis is placed on relating the idealization of the stability theory to physical processes in the boundary layer.

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A PORTFOLIO OF STABILITY CHARACTERISTICS OF INCOMPRESSIBLE BOUNDARY LAYERS

by

H.J. Obremski, M.V. Morkovin and M. Landahl

with contributions from

A.R. Wazzan, T.T. Okamura and A.M.O. Smith

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SUMMARY

A collection of linear amplification and propagation rates (temporal and spatial) for two similar and nonsimilar families of boundary layers is presented in graphical and tabular form. Their usage is illustrated for tracing the growth of disturbances in a flat-plate boundary layer which develops in x and varies periodically with t. If a user of the Portfolio can match the U"(y) distribution of his profile with that of a Portfolio profile over the central 80% of the boundary layer, the stability characteristics of the matched profile seem to provide him with satisfactory approximations for those of his own profile.

The utilization of the Portfolio information for estimating transition Reynolds numbers is discussed. Much improvement of our theoretical and experimental knowledge concerning freestream disturbances and the specific manner in which they bring about the growth of Tollmien-Schlichting waves will be needed before further progress can be made. Analysis of the numerical variations of stability characteristics with various features of the related profiles clarifies the role of U"(y) and of the location of the inflection point. The usual shape factor H emerges as the only simple parameter capable of correlating satisfactorily the minimum critical Reynolds number for nonsimilar profiles.

Throughout, emphasis is placed on relating the idealizations of the stability theory to physical processes in the boundary layer.

Segments dealing with the relationship between freestream disturbances and Tollmien-Schlichting waves were based on M.V. Morkovin's under Themis Project (USAF Contract F44620-69-C-0022) at the Illinois Institute of Technology.